METHODOLOGY OF RESEARCH IN EDUCATION

Kulbir Singh Sidhu

Research in every field, and more so in the field of education, is the need of the day. Progress in any field is directly linked with research in it. Our problems and difficulties in education further necessitate a purposeful and sustained research effort.

Educational planning has to be based on sound research findings. Researches carried out at other places may also help us in many ways but we cannot always depend on borrowed stuff.

The educational programmes of modern India cannot be run on age-old lines. So long as our research effort in education remains poor we shall continue to be counted as an educationally backward nation. Educational reform and progress necessitate a dedicated and competent team of research scholars.

The present book has been brought out to give scholars another source of knowledge. It may be found to have enriched the existing literature by putting most of the relevant material at one place and by providing to the needy student and teacher a compact volume on the subject. Readers will find the language and style of the book clear and easily understandable.

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METHODOLOGY OF RESEARCH
IN
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1. Statistics in Education and Psychology
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Methodology of Research in Education

[For M.Ed., M.A. (Edu.). M.A. (Psy.), M. Phil. Classes]

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Preface

Research in every field and more so in the field of education is demand of the day. Progress in any field is directly linked with research in that field. Our problems and difficulties in the field of education further necessitate a purposeful and sustained research effort. We need a large number of research scholars who may take up the huge task of providing new directions to our educational theories and practices. Educational planning has to be based on sound research findings. The researches carried out at other places may also help us in many ways but we cannot always depend on the borrowed and imported stuff. We have to adopt an Indianised approach to the problems and requirements of Indian Education. Thus we have to largely depend on researches carried out on our own soil by our own research scholars. The educational programmes of modern India cannot be run on age-old lines. So long as our research effort in Education remains poor we shall continue to be counted as an educationally backward nation. Educational reform and progress necessitate a dedicated and competent team of research scholars. Departments of Education set up by various Universities, various Colleges of Education and many other institutions and agencies are engaged in the task of preparing and training prospective research workers. They have already at their disposal huge stocks of variety of relevant reference and reading material. The present book is being brought out to give to them another source. It may be found to have enriched the existing literature by putting most of the relevant material at one place and by providing to the needy student and teacher a compact volume on the subject. The readers may also find the language and style of the book as more readable and acceptable.

The author has now taught this subject for about two decades. His background and experience in this subject have prompted him to produce this book. Especially when he found that the students and teachers had to search for the material in many sources, he thought of doing this service to the cause of the subject and its students. This attempt is aimed at satisfying a long-felt need of the readers. They will find it fulfilling the requirements of their syllabi and courses also.

Other books written by the author on various aspects of education have been well received. He has already written on all the other subjects he taught from time to time. His duty towards the subject of Methodology of Research in Education remained to be fulfilled. With the present book he has carried out this duty at last. He has every hope that his latest service to the cause of Education, teachers and learners will also be adequately received.

January 25, 1984.

Kulbir Singh Sidhu

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ONE

Research—An Introduction

Before we discuss the implications and importance of research, it is desirable that we try to understand its meanings.

Dictionaries describe it as careful search or inquiry, endeavour to discover new ideas by scientific study, —a course of critical investigation.

Research is such a vast and multi-dimensional concept that ordinary definitions cannot project its meanings completely. Various definitions given by experts in the subject are being reproduced below in order to obtain a better understanding of its meanings.

Research is endless quest for knowledge or unending search for truth. It brings to light new knowledge or corrects previous errors and misconceptions and adds in an orderly way to the existing body of knowledge. The knowledge obtained by research is scientific and objective and is a matter of rational understanding, common verification and experience.

It is a deliberate effort to collect information, to sift it, to analyze it, to put it together and to evaluate it. It works with a high degree of organisation on a rather well-defined problem and pursues it hopefully to a successful conclusion. It is a careful search for solutions to the problems that plague and puzzle the mankind.

P.M. Cook—Research is an honest, exhaustive, intelligent searching for facts and their meanings or implications with reference to a given problem. It is the process of arriving at dependable solutions to problems through the planned and systematic collection, analysis and interpretation of data. The best research is that which is reliable, verifiable and exhaustive so that it provides information in which we have confidence.

J.W. Best.—Research is considered to be the more formal, systematic, intensive process of carrying on the scientific method of analysis. It involves a more systematic structure of investigation usually resulting in some sort of formal record of procedures and a report of results or conclusions.

C.C. Crawford—Research is a systematic and refined technique of thinking, employing specialised tools, instruments and procedures in order to obtain a more adequate solution of a problem than would be possible under ordinary means. It starts with a problem, collects data or facts, analyses them critically and reaches decisions based on the actual evidence.

Travers—Educational research is that activity which is directed towards development of a science of behaviour in educational institutions. The ultimate aim of such a science is to provide knowledge that will permit the educator to achieve his goals by the most effective methods.

J. Francis Rummel—Research is an endeavour to discover, develop and verify knowledge. It is an intellectual process that has developed over hundreds of years, ever changing in purpose and form and always searching for truth.

Clifford Woody—Research is a careful inquiry or examination in seeking facts or principles, a diligent investigation to ascertain something.

R.M. Hutchins—Research in the sense of the development, elaboration and refinement of principles together with the collection and use of empirical materials to aid in these processes, is one of the highest activities of a university and one in which all its professors should be engaged.

Rusk—Research is a point of view, an attitude of inquiry or a frame of mind. It asks questions which have hitherto not been asked and it seeks to answer them by following a fairly definite procedure. It is not a mere theorising, but rather an attempt to elicit facts and to face them once they have been assembled.

Research is likewise not an attempt to bolster up preconceived opinions, and it implies a readiness to accept the conclusions to which an inquiry leads, no matter how unwelcome they may prove.

When successful, research adds to the scientific knowledge of the subject.

George G. Mouly—The systematic and scholarly application of the scientific method, interpreted in its broadest sense, to the solution of educational problems ; conversely, any systematic study designed to promote the development of education as a science can be considered educational research.

W.S. Monroe—Research may be defined as a method of studying problems whose solutions are to be desired partly or wholly from facts. The facts dealt with in research may be statements of opinions. historical facts, those contained in records and reports, the results of tests, answers to questionnaires, experimental data of any sort, and so forth. The final purpose of educational research is to ascertain principles and develop procedures for use in the field of education; therefore, it should conclude by formulating principles or procedures. The mere collection and tabulation of facts is not enough, though it may be preliminary to it or even a part thereof.

KNOWLEDGE AND RESEARCH

Human knowledge works at two levels. At the primary level it functions as the basis of useful human activities, as when a teacher solves mathematical problems for the students or as when a doctor uses his knowledge to cure diseases. At the secondary level, knowledge is employed to obtain increments in the existing knowledge. The activity that produces this new knowledge is known as research. All research is an advance on existing frontiers of knowledge. It takes us beyond the frontiers of present knowledge. Both breaking fresh ground and improving existing knowledge, are the proper functions of research.

Research adds to the existing knowledge in an orderly way. This orderliness is to be particularly emphasized. Mere aimless and confused groping for new knowledge does not stand for research.

The knowledge which accrues from research is verified and is verifiable by anybody who may like to do so. The process by which it has been derived is replieable i.e. it can be repeated and the stated results confirmed. It is objective and capable of 'third party' verification.

RESEARCH AND PROGRESS

Research has proved to be an essential and powerful tool in leading man towards progress. Without systematic research, and its application, there would have been very little progress.

"The secret of our cultural development has been research, pushing back the areas of ignorance by discovering new truths, which, in turn, lead to better ways of doing things and better products".

All significant research leads to progress in one field of life or the other. Every other day new ways of doing things enter into our lives. All of these and many more are the fruits and rewards of our research effort. Research shows us the way in our difficulties. It opens new avenues and provides to us better alternatives. The gifts of research are exceedingly evident in the form of cures for diseases considered earlier as incurable, machines capable to replace man, green revolution, taming of rivers, sophisticated methods and techniques for every profession, scientific understanding of human behaviour, knowledge explosion and so on.

The goal of all research is progress and good life. It is one of the most valuable services rendered towards mankind. It enhances the efficiency of all the agencies engaged in the welfare and the uplift of man.

RESEARCH AND SCIENTIFIC THINKING

Research is often defined as scientific thinking. It will be of interest here to know the oneness of these two terms. When we are able to describe the nature of scientific thinking, we shall be in a better position to visualise as to how research and scientific thinking are alike. It is man's unending search for truth which has brought him to stage the of scientific thinking as the main source of evidence. Human thinking has ultimately decided to adopt scientific thinking as the main source after having tried and tested many other sources. His thinking has passed through a long process of evolution to reach finally this latest stage of scientific thinking.

Man in his search for truth has appealed, in general, to five sources of evidence :

1. Custom and tradition
2. Authority
3. Personal experience
4. Reasoning from self-evident propositions
5. Scientific enquiry.

These five sources of evidence represent a rough and overlapping chronological sequence in the history of human thinking, man's earliest search for truth being characterized by an appeal to custom, tradition, authority and personal experience and later by an appeal to syllogistic reasoning and scientific equiry. Although it is evident that man has not yet devised any perfect methods of searching for truth, it appears that, with the passage of time, improvements have been made in this respect.

1. The Appeal to Custom and Tradition. The dependence on custom and tradition is to some extent a necessary human economy. As far as possible we refer to custom and tradition in the event of solving a problem. In many activities and situations this ready-reckoner serves the purpose very well. It largely determines our mode of living, mode of thinking, mode of tackling our problems, mode of facing the situations and mode of making adjustments. The combined customs and traditions specify for us our food, clothes, speech, dealings, etc. Ordinarily we obey the customs and traditions and avoid violating them. We try to seek explanations of the phenomena through the media of customs and traditions.

When we allow customs and traditions to prevail rigidly and follow them almost blindly there is bound to result in us an intellectual stagnation. Total subservience to customs and traditions would rather block thinking. Ultimately when man recognized his own mental

inadequacies in this respect, a great step forward was taken in the development of human thinking.

Still we can observe around that customs and traditions continue to remain one of our guiding light tn facing various situations and problems.

2. The Appeal to Authority. In an unforeseen situation or in times of storm, crisis, calamities and conflict man often finds the dictates of custom and tradition inadequate. He is obliged to come out of his complacency and to look for newer and better modes of behaviour. The savage man appealed to the tribal wise man and to his gods in times of crises. The tribal chief remained the supreme authority for many centuries and his subjects considered him as an all-knowing and all-competent superman. They looked to him for guidance and advice in their social, religious, economic, political and even private affairs. Then the church through the medium of priest assumed the role of authority. The followers turned to the priest for knowledge, advice, explanation of the phenomena, domestic problems, medical treatment and ultimately salvation.

Then the state or the king entered the scene to share this authority. The state was considered to be all powerful and the king its embodiment. The citizens referred their problems and complications to the king for obtaining a remedy or solution. With the growth of the strong democracies the authority of the ruler has been taken over by the legislatures and parliaments. In the modern civilization the real authority lies not with a person or a group of persons but with the written and documented constitution of the state. The problems, issues, conflicts or disputes are now settled in the light of constitutional provisions.

Above all, the expert or the scholar is a centre of authority to whom we look in times of crises still. The scholars, philosophers, economists or scientists are the most dependable interperters of the existing knowledge, evidence as well as the sources of new ideas, innovations and inspirations. The expert of a discipline is considered to have a solution for every problem of the area concerned.

3. The Appeal to Personal Experience. Now the man progressed towards an era of self dependence and independence. He thought that he should not refer his difficulties and problems to others but should try to solve them by himself. He should look to his personal experience for evidence and not run after outer sources for help. No single source of evidence is more universally employed in the search for truth than is personal experience. When confronted with a difficult situation, one usually turns first to his own experiences. If one's own experience are inadequate he may turn to those of friends and acquaintances. If the problem is of sufficient importance and of a long standing and if others have left behind the records of their experiences with it, he may profit by an appeal to history, The appeal to personal experience is no doubt very valuable but it is subject to many inaccuracies—like hasty generalizations from insufficient evidence, dependence on subjective judgement, the omission of evidence contrary to one's opinion, erroneous conclusions due to prepossessions, preconceived ideas and prejudices and argument from positive instances and the neglect of negative instances.

The intimate connection between personal experience and science is very important and clear. Science itself is an appeal to experience. Science begins with the distinctions, tentative generalizations, and the suppositions found in ordinary experience and extends these by making them more definite and consistent. The man did not, however remain contented for long with personal experience as the final source of evidence. He moved to next stage in the process of evolution of his thinking.

4. The Appeal to Reasoning from Self-evident Propositions. Here the man started thinking about his own thinking. It was a great step forward. The product of man's early intellectual efforts was deductive logic, founded by Aristotle and perfected by the medieval scholars. The chief instrument of deduction was the syllogism, composed of a major premise, a minor premise and a conclusion, as for example

1. All thieves deserve punishment
2. Satish is a thief
3. therefore, Satish deserves punishment,

Or

1. All gifted children deserve special education
2. Naresh is a gifted child
3. therefore, Naresh deserves special education.

The essence of such syllogistic reasoning consists of showing that a given particular case falls under a general rule. It consisted chiefly of proving or disproving selected statements by the use of appropriate logic. This approach tended to degenerate into mere argumentation for its own sake and contributed relatively little as a means of discovering truth.

The primary weakness of the syllogism, however, is in its premises. These were accepted as authoritative or as apparently self-evident from experience. A secondary weakness arises from the indefinite, ambiguous and elusive verbal symbolism of logical terms and propositions. Words have many interpretations, meaning different things to different people at different times.

Although this approach to problem solving is not generally favoured today, the fact remains that it contains much of value for present and future problem solving. The chief difficulties are its acceptance of premises as self-evident and the elusiveness of verbal symbols. Still it should be said that the conventions of deductive logic are just as true today as ever. If one accepts that scientific inquiry is an inductive-deductive process, principles of logic are tremendously important. There is much in this approach that is indispensable to good thinking.

5. **The Appeal to Scientific Inquiry**. The beginning of scientific method is assigned to the seventeenth century. Viewed historically, man's first explanations of the natural phenomena were expressed in terms of the supernatural. It is evident in the savage man's belief in magic, charms, gods and other supernatural forces. Unable to understand the complexity of the natural environment, he appealed to the supernatural. These explanations were recorded in the traditions of the tribe and interpreted by the tribal wise men.

Gradually, as man emerged from savagery into civilization, he began to note many real and imagined relationships in nature, such as men are physically stronger than women, a circle around the moon portends bad weather, fat men are more jovial than lean, individuals who learn rapidly forget rapidly, and features are indicative of criminal tendencies. All such unexplained uniformities growing out of the trial-and-error experiences of the race are called empirical knowledge. As a result there are empirical agriculture, empirical medicine and empirical education. One may know, for example, that certain drugs will produce certain effects, without knowing the physiological processes involved. Although man must frequently content himself with these empirical findings, the ultimate goal of science is complete explanation. When one is able to understand the uniformities of nature and to offer satisfactory principles of explanation, one's knowledge is complete, comprehensive and scientific. This is the ultimate goal of science.

The Nature of Scientific Thinking. The scientific method of research is an inductive—deductive mode of thinking through which one seeks to discover, establish and explain the uniformities of nature by appealing to experience. It involves a double movement of thought, first, a movement from the partially known and sometimes confused data of experience, secured from all available sources (observation, reading, conversation, reflective thinking and previous investigation) towards universal relationships expressed as hypotheses, laws or propositions that is *from the particular to the general* ; and second a movement from these general propositions to the particular facts or data of experience, that is, *from the general to the particular*. Induction begins with facts and moves in the direction of some principle, hypothesis or explanation. Deduction aims at the verification and proof of hypothesis by bringing its logical implications into line with the facts of the case. Thus scientific thinking starts with facts and continually returns to facts to test and verify its hypotheses.

DISTINGUISHING CHARACTERISTICS OF SCIENTIFIC THINKING

This is the age of science and technology. Modern culture is overridden with scientific attitude and scientific methods of approach. With the fast development of physical and biological sciences, the science of research has become a reliable instrument of man for the advancement of knowledge on the one hand and his material progress on the other. Research has discovered for him the methods of improving both the processes and the products.

Research is rightly considered as a science because it makes use of methods and systems for deriving truth like science. But research is yet an infant science.

To secure better conception of the scientific method of investigation, we shall discuss briefly some of its distinguishing features.

Science is based on facts. The greatest discovery ever made in human thinking was to look and see for determining the presence of a thing. The scientists cannot construct or confirm any theory without the aid of facts. The history of science is full of instances of simple observation of facts that have led to the formulation of important theories. Theories must be tailored to fit the facts and remodeled whenever new facts reveal the need for such action. Additional facts can give greater specificity and breadth to a theory.

Science employs the method of analysis. In the comprehension of complex phenomena, science employs the method of analysis. The most difficult problems of life can be better comprehended by breaking them into parts and by attending to each part separately. Analysis is an important step in problem solving. It proceeds by resolving gross total situation into elements in order that the investigator may give each part his separate and undivided attention. It is then possible to encompass situations otherwise incomprehensible.

Science employs hypotheses. In guiding the thinking process, science employs hypotheses. When our experience shows that two phenomena are so related that one follows the other, we conclude that the latter is connected with the former by some sort of relationship and we frame a hypothesis indicating this relationship. This hypothetical anticipation of nature's laws constitutes one of the most distinguishing features of the scientific method of inquiry. We do not wait for a complete enumeration of all of the facts. but jump sooner or later to some sort of tentative supposition or provisional guess. This hypothesis seems to explain the situation under observation. Once entertained, such a hypothesis becomes the starting point for further investigation. As the research progresses, we sometimes find it necessary to discard one hypothesis in favour of another. Hypotheses are islands in the stream of thought.

Science is free from emotional bias. A scientific investigation demands an alert, flexible and open mind, a mind free from emotional bias. The scientist is alert and on the watch for new ideas, he is flexible and ready to modify old ideas in the light of new evidence and he never allows his own personal likes and dislikes to colour the facts. Scientific knowledge is de-personalised and de-emotionalized knowledge and is free from emotional halo.

Science employs objective measurement. The scientist measures, weighs, tests, and accurately determines amount of phenomena under investigation. The progress of the sciences has always been closely related to the development and refinement of instruments of measurement. As the sciences advance, they become more and more accurately quantitative. Progress in the scientific study of education, for example, has been closely associated with the development of accurate instruments of measurement.

Science uses quantitative methods in the treatment of data. Instead of relying upon estimates, guesses, and general impressions, the scientist measures the phenomena under consideration as accurately as possible. The results of his measurements are recorded in comparable units that may be counted, added, subtracted, multiplied and divided. Instead of employing verbalism, general impressions, estimates etc., the scientist employs the new and more exact language of mathematics to make the analysis, classification and summarization of data more reliable. He summarizes the facts into mathematical values, such as, means, medians, modes, probable errors, deviations, and coefficients of correlation which are less ambiguous than the terms of ordinary language.

STEPS IN THE PROCESS OF SCIENTIFIC THINKING

A further characterization of the general methodology of scientific research can be obtained from a discussion of the logical steps involved in scientific thinking. Briefly they may be stated as follows :

1. The location and definition of a problem.

2. Survey of past experiences with the problem, previous investigations and the already available data to get ideas about the past and possible future solutions and methods of investigation.

3. The formation of a hypothesis (or hypotheses) representing a tentative solution of the problem under investigation, to be employed as a guide in the collection of additional data which may lead to an accepted solution of the problem.

4. The mental elaboration of the hypothesis (or hypotheses) checking for agreement with fact, verifiability and logical consistency.

5. The collection of additional data (if necessary) through a new appeal to experience by means of measurement, observation and experimentation.

6. The analysis, classification, and summarization of the data collected.

7. The formulation of new generalizations representing observed uniformities, explanatory principles, or scientific law.

CHARACTERISTICS OF RESEARCH

After we have gone through the characteristics of scientific thinking, we can move to the next logical step of knowing the specific characteristics of research.

1. *Research gathers new knowledge or data from primary or first hand sources.* It is not research when one simply restates or reorganizes what is already known or what has been written. Research endeavours to reach the first hand source of data instead of serving its purpose with the data available from second hand sources.

2. *Research is expert, systematic and accurate investigation.* The researcher tries to secure an expertise before undertaking any investigation. He plans his procedures carefully. The data are gathered, recorded and analyzed with as complete accuracy as possible. He uses standardised and valid data-gathering tools or instruments as he can find or devise. He also employs mechanical means to improve upon the accuracy of human observation, recording and computation of data.

3. *Research is logical and objective,* applying every possible test to verify the data collected and the procedures employed. The researcher eliminates personal feelings and preferences from his research activity. He resists the temptation to seek only that data which support his hypothesis. There is no attempt to persuade or to prove. The emphasis is on testing, rather than on proving the hypothesis. He argues within the scope and relevance of his data. He builds only those generalizations which directly emerge out of the data.

4. *Research endeavours to organize data in quantitative terms* as far as possible. It further tries to express them as numerical measures.

5. *Research is patient and unhurried.* The researcher is willing to make painstaking effort. He works patiently towards sound conclusions. He realizes that significant findings do not come as a result of hurried and careless procedures.

6. *Research requires courage.* The researcher is not afraid of unpleasant consequences of his findings. He has the guts to speak and record the truth. He is willing to follow his procedures to conclusions that may be unpopular and bring social disapproval. We can mention several historic examples of the penalties which researchers suffered because their findings came in conflict with dogmas or commonly accepted beliefs.

7. *Research is highly purposive.* It deals with a significant problem which demands a solution.

8. *Research places emphasis upon the discovery of general principles and scientific generalizations* that can be applied to the solution of a wide range of problems.

9. *Research maintains rigorous standards.* The research worker is expected to be a scholarly and imaginative person possessing highest integrity. He takes each step according to expected specifications and

norms. He keeps his work scrupulously free from loopholes. Research is a job of great responsibility. Its findings carry far reaching implications.

10. *Research usually iuvolves, as a step, a hypothesis* or a set of hypotheses concerning the tentative explanation of a phenomenon or the solution of a problem.

11. *Research is carefully recorded and reported.* Every term is carefully defined, all procedures are described in detail, all limiting factors are recognized, all references are carefully documented and all results are objectively recorded. All conclusions and generalizations are cautiously arrived at with due consideration for all of the limitations of methodology, data collected, and errors of human interpretation.

SPECIFIC CHARACTERISTICS OF EDUCATIONAL RESEARCH

Scientific research as already stated observes rigorous standards and possesses sound characteristics. Educational research cannot be scientific to that extent. It is not as empirical, inductive and exact as the scientific research. Because of its limitations, the nature of material it handles, the nature of problems it attempts to solve, the nature of tools it adopts, and the way it draws its conclusions and generalisations, educational research does acquire certain special features and specific characteristics, which are as follows :

1. *A sound philosophy of education forms the basis of educational research.* This philosophy gives us the basis for evaluating any principles and activities of research. Most of the problems are highly complex and their philosophical nature demands that in their solution we must not lose sight of ultimate values in life and education. Robert R. Rusk has observed—"In the application of scientific procedure to education, a sound philosophy—as well as a sound commonsense—must be invoked to save the scientific procedure from itself."

2. *It needs imagination and insight as much as scientific attitude of mind.* In addition to its practical practitioners and skilled investigators, education stands in need of men and women of insight and imagination who are capable to look beyond the present. Educational research deals with the problems of motivation and ethics which necessitate varied interpretations and assumptions. Its needs cannot be satisfied without a reasonable degree of imagination and insight.

3. *It requires an inter-disciplinary approach.* Educational research is related to the study of complex relationships which involve reference to various disciplines. An educational problem can acquire the characteristics of several disciplines like Philosophy, Psychology, Sociology, Anthropology, Economics, History and Political Science.

4. *It usually employs deductive reasoning.* The sciences of mind commonly use methods of description, explanation, interpretation,

sympathetic or intuitive understanding. These methods are mainly subjective, speculative and deductive in nature. Their results cannot be subjected to rigid measurement or mathematical procedures.

5. *It is not as exact as research in physical scienes.* Social or behavioural sciences like Education, Psychology and Sociology have not achieved the level of specification possible in the case of physical sciences. The method of interview, for example, commonly used in these sciences, is a combination of art and science. Social problems present an increasingly large range of variables and multitude of causes that bring about a certain result. Difficulties of manipulating and controlling all the variables put limits on the exactness and precision of results arrived at in Social or Psychological experimentation.

6. *It comes out of a desire to do things better.* Better education, better schools and better results of education are the chief purposes before a research worker in Education. Research for practical people like teachers, headmasters and supervisors should arise out of this very desire. It helps them to narrow down the proverbial gap between theory and practice in Education.

7. *It is not the field of the specialist only.* Any teacher with reasonable common sense, intelligence and insight can undertake research in education. This research carried out in the day-to-day problems of the school will concern itself with child development, teacher-pupil relationships, interaction with the community, teaching techniques and many other things.

8. *It generally requires inexpensive material.* In most of educational investigations we simply need subjects, i.e. children, their items of daily use, paper, pencil and books and a few tests.

9. *It is incapable of being dealt through empirical methods.* Most of the matter of social sciences is qualitative and does not admit of quantitative statement. Qualitative analysis will enter into even the highly statistical studies. Our thinking will cover a field larger than our measurements and our generalizations will remain qualitative in form.

10. *It is based on interdependence of causes and effect.* In the case of a social phenomena the cause and the effect are interdependent and one stimulates the other. It becomes very difficult sometimes to find out as to what is the cause and what is the effect. When we enquire, which of the two related social phenomena is cause and which the effect, it usually turns out that both are cause and both are effect. For example, we ask—are low wages a cause of poverty ? Yes, but is not poverty a cause of low wages ? Unless we realise this fact we will be asking wrong questions and finding wrong answers.

11. *Educational research cannot be a mechanical process.* There is no educational problem worth studying which does not include unknown elements and does not require a fresh approach and attack. Genuine

contribution to education cannot be made without research worker's willingness to pioneer into new fields or to work out new procedures. Genuine research must be an exploration, a gamble. The mere amassing, reporting, stating and defining the facts in a numerical form is in itself not educational research.

CLASSIFICATIONS OF RESEARCH

Research can be classified under three broad categories ; basic or fundamental research, applied research and action research. It must not, however, be forgotten that the lines of demarcation between these categories are not very clear-cut and sharp. In many ways they appear to overlap one another.

Basic or Fundamental Research

It is also called pure research. Research is basic or fundamental when it is not concerned so much with day to day phenomena and problems. It is rather concerned with the solution of fundamental problems and major or vital issues. It gives its results in the form of broad generalizations or principles and theories. It aims at the discovery of some basic truths and laws and is not immediately concerned with direct field applications. It emphasizes control and precision and gives less attention to direct application of results in a field situation. It is usually carried out in a well equipped laboratory. Since it is concerned with fundamental principles of behaviour it may use animals rather than human beings as subjects of study.

In the field of education, discovery of such useful concepts as motivation, reinforcement, concept formation in learning are the results of fundamental type of research. A lot of basic research bearing implications on education has been done by workers in other disciplines such as Psychology, Sociology and Philosophy. Work on topics like 'stages of development', 'role of heredity and environment', 'educational values', 'aims of education', 'role of activity in learning', 'curriculum, etc.' belongs to this type of research. This research is done by the outstanding experts with the help of choicest facilities. It demands higher level of problems, procedures, tools, controls, analyses, etc. It is expected to be more expert as it has far reaching consequences.

Applied Research

It is also called field research. It is primarily that type of research work the results of which find direct application in the field. It is preferably devoted to the problems of the field workers or other affected individuals. It is more interested in the theories, principles or laws which work. A fundamental research may propound a theory or discover a law and stop at that. But applied research is concerned primarily with the testing of such theories or laws in the actual field setting. The theories established through research on certain samples are tested upon and applied to other samples.

Applied research, however is bound to sacrifice controls and precision to some extent as compared with fundamental research.

Application of the same fundamentals may have to be tested from field to field. Modifications may have to be made in fundamentals from region to region and from country to country.

Research on topics like effect of various devices on learning, use of text books, day to day testing, parental cooperation, improvement in examination system, library and laboratory facilities, etc. belongs to this category.

Action Research

Action research is similar to applied research in many ways. The only differences can be that applied research may be carried out on a larger sample resulting into more universally applicable findings. As against this, action research will primarily be conducted on the immediately available small sample in order to solve the immediate problem for the same group. Applied research may quite often be carried out by experts whereas action research is primarily the concern of the field workers.

The advocates of action research have charged fundamental research with a failure to make a significant contribution to "grass roots" education. Stephen M. Corey states..."I have lost much of faith I once had in the consequences of asking only the professional educational investigator to study the schools and to recommend what they should do. Incorporating these recommendations into the behaviour pattern of practitioners involves some problems that so far have been insoluble....The studies must be undertaken by those who may have to change the way they do things as a result of the studies."

Action research is undertaken by educational practitioners because they believe that by so doing they can make better decisions and engage in better actions. The teachers, supervisors and administrators would make better decisions and engage in more effective practices if they conducted research as a basis for these decisions and practices. The process by which practitioners attempt to study their problems scieniefically in order to guide, correct and evaluate their decisions and actions is what is called action research. A teacher conducts action research to improve his own teaching. A school administrator conducts action research to improve his administrative behaviour.

This resesarch represents an approach to be more disciplined, more objective and more scientific. It is a procedure that tries to keep problem solving in close touch with reality at every stage. It is focussed on the immediate application, not on the development of theory. It is concerned with the immediatete problem here and now in a local setting. Its findings are to be evaluated in terms of local applicability, not in terms of universal validity.

It implies that research will no longer remain the exclusive preserve of research scholar, rather an average teacher of a small school will also undertake research projects, with research specialist serving either as consultant or as member of the research team. Apart from improving the school practices, this research will also improve those who are to improve the practices. Action research combines the research function with teacher growth in such qualities as objectivity, research skill, habits of thinking, harmoneous group work and professional spirit.

Let us not think here that there is any conflict between fundamental research and action research. The difference is only in emphasis and not in method or spirit. Each type is committed to the high standards of scientific objectivity and scholarship. A student of education should understand and appreciate fundamental research as part of his professional training and should understand that sound educational theory is built on fundamental research. Without this understanding he is merely a mechanic or a craftsman and has no right to be considered professional practitioner.

If classroom teachers are to make an active research contribution, it will probably be in the area of action research. Many educational observers see in action research one of the most promising avenues for teacher growth, professional improvement and the development of a better system of education.

Scope. The scope of action research is very vast. This approach of dealing with practical problems seems to be appropriate and promising for all kinds of professional workers in education so long as their desire is to improve their own professional practices. An administrator who is dissatisfied with his efforts to develop a high morale in his staff could approach this problem with action research.

Advantages. 1. A person who must improve if the problem is to be solved is actively engaged in the process of improvement from the very beginning.

2. Action research emphasizes a desirable decentralisation of decision-making and action.

3. The research experience will broaden and deepen the field worker's general fund of knowledge and give him some appreciation of the powerful part research plays in fashioning our lives. It will open up an interesting new world for him.

4. As an educator, the person is obliged to become sufficiently informed about research to offer sound guidance to students. Today, better instructional procedures are organized around problem-solving activities rather than rote memorization. Therefore he must also help students acquire skill in scientific methods of solving problems. Moreover some exceptionally able youths have to be oriented towards the pursuit of research as a career. The field worker cannot perform these services satisfactorily unless he becomes well acquainted with research work.

5. Research will help the teacher acquire new interests, new motives and new insights that will replenish his energies and enthusiasms and revitalize his instructional procedures. Research will awaken his curiosity, shatter some pet entrenched ideas and attitudes and make him question traditional practices. He will embark on an exciting quest for new viewpoints and better ways of planning and guiding children's learning experiences. The thrill of working on the frontiers of knowledge, the satisfaction of experiencing continuous professional growth, and the glow of personal pride that arises from doing superior work are the rich rewards that he will experience from studying research findings and applying them in the class room.

6. There is a wide gap between research findings and their application. Most of the studies never receive any consideration. In case the teacher himself undergoes a research experience, he will develop a better appreciation for the research done by competent scholars and the conclusions drawn by them for their implementation in the field. After having participated in action research, the teacher will play a better role in translating various research findings into practice. One's own findings are more willingly implemented.

7. Action research experience strengthens the profession as a whole. The practitioners remain helpless if they are deprived of research based theories. They cannot expect the field to gain public recognition as a full-fledged profession without building a body of competent research. They cannot also gain the confidence of the public by practising new educational practices without evaluating their worth. Developing a sincere interest in research will also help them establish better relationships with colleagues, administrators and parents. Their enthusiasm for finding better ways of doing things will have a stimulating effect on others.

8. Although most classroom teachers are appliers rather than producers of research, but in future more and more of them will be called upon to play a role in research. They will have to come forward to take part in action research movement. Their entry into the world of research will enable them to read reports or summaries of research more intelligently ; it will provide a foundation for more advanced study ; and it may help them to prepare themselves as specialists in this field where the profession desparately needs qualified men.

9. It introduces experimental outlook among the field workers.

10. It brings decentralisation in research.

COMPARISON OF FUNDAMENTAL RESEARCH AND ACTION RESEARCH

This comparison can be made as follows in respect of various aspects of any research work.

Aspects	Fundamental Research	Action Research
1. Objectives	Its purpose is to develop and test educational theories and to obtain universally applicable principles.	Knowledge obtained is intended to be applied in local setting. It also provides a sort of in-service training to participating field workers.
2. Expertise	Expert training is needed in measurement, research methodology and statistics.	Only an ordinary training may suffice. Action research can be done by an average teacher under the guidance of a consultant.
3. Locating the research problem	A wide range of methods and a vast process is used to locate the research problem.	It deals with the problems which hinder class-room teaching-learning process. Thus the participating teachers can easily identify them.
4. Involvement	The research worker may not be personally involved in the problem he selects for research.	The teacher is invariably involved in the research problem.
5. Hypotheses	Highly specific and well stated hypotheses are formulated and adopted.	Only the specific statement of the problem serves as a hypothesis.
6. Review of literature	It necessitates an exhaustive and thorough review of literature in order to have a complete understanding of the accumulated knowledge in the area.	It demands simply a general understanding of the area. There is no need for a thorough and intensive review.
7. Sampling	A random or otherwise unbiased sample of the population is studied.	Pupils studying in the particular class taught by the teacher are used as subjects.
8. Design	Careful attention is paid to maintain comparable conditions thus reducing error and bias.	Procedures are planned only in general terms.

9. Analysis of data	Complex analysis is often called for.	Simple procedures for analysis are considered sufficient.
10. Statistical treatment	There is stress on befitting statistical treatment of data for the sake of objectivity.	Not much stress on objectivity and statistical treatment. Even the subjective opinion of participating teachers is given weightage.
11. Application of results	The research findings usually remain confined to research reports and publications. There is no coordination between the research workers and field workers to ensure utilisation of valuable conclusions.	Findings are applied straightaway to the classes of participating teachers and lead to far-reaching improvements in the teaching-learning process.

Limitations of Action Research

1. It is poor quality research. In all its aspects and steps it serves its purpose with sub-standard methods, procedures, techniques and tools. Even the participating teacher lacks in training and expertise. The level of work and outcome gets diluted in the hands of an ill-equipped and unprepared research worker. According to George G. Mouly, "Action research can become a case of the blind leading the blind and the problem is further aggravated by the fact that teachers generally are too close to their problems and too untrained in scientific objectivity to be vigorous and objective in their approach."

2. It is an unduly localised research effort. The generalisations cannot acquire a universal validity. The applicability of findings to another class and another school is quite doubtful.

3. It may become an additional burden on an already overburdened teacher.

4. Because of numerous limitations, it may produce wrong and unverifiable conclusions.

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Historical Development of Educational Research

THE BEGINNING OF RESEARCH

George J. Mouly has said – "The means by which man seeks the answers to his problems can be classified under three broad categories : experience, reasoning and experimentation."

The beginning of research can be traced back to the prehistoric times when man worked in his search for truth. Search and research have been perenial functions of man to elevate himself in his life.

In the primitive man, the Nature aroused unlimited curiosity that made him search for truth about the nature of Nature and about his own status in that Nature. Thus began the philosophical, theological and metaphysical studies. When man began his study of the environmental phenomena to understand what existed around him, and with what he was constantly interacting, there developed physical and natural sciences. When he began to study about the origin of the society and other social phenomena, the social or humanistic sciences originated.

For all the attempts that were made by man, the main goal was to understand and conquer nature. His natural endowments, such as intellect, thinking, reasoning, imagination, memory, judgement, ability for analysis and synthesis enabled him to study and experiment with the environment throughout his life-span. Thus he developed the fund of knowledge which was accumulated and transmitted to posterity as the cultural and social heritage by virtue of his ability for preservation, conservation and communication.

The report of the University Education Commission of 1948 has made the following observation in this regard – "Human civilization has derived great benefits from the efforts of specialists who have penetrated even more deeply into the secrets of nature and the motives and process of human behaviour, individual and social. To a constantly increasing extent modern life is the outcome of research."

The beginning of research can be traced back to the development of thinking in man.

Egyptians, perhaps, were the first people to make recorded attempts at science. Faced with the annual problem of flooding of the Nile, they developed the calendar, geometry and surveying.

The Greeks initiated in the fields of medicine and astronomy. Aristotle's system of classification and syllogism formed the basis for further deductive systematisation of human experience.

The syllological approach was considered to be true, relevant, satisfactory and adequate for all purposes during the Hellenistic and Roman periods and upto the times of Renaissance and the days of Galileo.

In the very beginning of the seventeenth century, Francis Bacon led a rebellion against the idea that logic was adequate for the discovery of truth. He was of the view that "the subtlety of nature is greater many times over than the subtlety of argument." Bacon broke the stanglehold of the deductive method and ushered in an era in which such men as Galileo, Lavoisier, Harvey, and Darwin rejected logic and authority as sources of truth and turned to nature itself for the solution of man's scientific problems. They used logic, experience and authority as sources of hypothesis rather than of proof and insisted on empirical proof for the verification of their hypothesis. Inductive deductive method, therefore became the method of the modern researcher which combines in it Aristotelian deduction with Baconian induction.

ORIGIN OF EDUCATIONAL RESEARCH

Educational research, as it is known today, is a relatively new field of research. It is only the last fifty years or so that are characterized by increasing readiness to apply methods of research to the solution of educational problems, Great Britain and the United States of America can very safely be termed as pioneer countries in educational research. Impelled by their own educational needs and problems and inspired by the pioneering work by a few developed countries, almost all the countries of the world are now engaged in some sort of educational research. The rise of democracy and a continuous expansion of education have been invariably accompanied by more and more of research in this field all over the world.

Everywhere, educational research has passed through stages in its manner of solving educational problems. The earliest effort aimed at improvement in the field of education may be given the name of *personal experience method*. Changes of some kind were introduced in educational practices as a result of the experiences of certain experienced educators. This was generally followed by *deliberative approach* consisting in a discussion of problems leading towards committee action, which system continues even today. The era of *objective measurement* and *systematic research* in education destined to revolutionize appraisal and research techniques is the latest stage. As in other subjects, research in education has also passed through the stages of trial and error, authority and tradition, speculation and argumentation and hypothesis and experimentation.

The Pioneering Period of Educational Reseach (1900—1915)

During this period, the following major developments occurred in educational research :—

—development of measuring instruments, techniques and procedures for collecting and interpreting data.

—development of statistical techniques, tools for psychological, intellectual, educational, attitudinal and aptitudinal measurement and techniques of experimental controls and designs.

—application of different techniques and procedures in evaluating the effectiveness of educational programmes and processes ;

—development of programmes of organised research, etc.

The period of expansion of educational research (1916—1935)

—By 1925 almost all the fields of educational research had almost been investigated into.

—By 1930 initial evaluation and review of the growth and development of educational research commenced.

—By 1935 compilation of educational researches was made.

The period of assessment and reorientation (1936—1946)

—By 1937, educational research expanded so much that the number of investigations per year went upto about 5000 according to Monroe.

—By 1945, critical attitude towards the method of educational research developed.

The period of modernisation and consolidation (1946 onwards)

After World War II, the science of educational research got itself further consolidated and modernised, especially due to the new fillip it gained in the western countries.

—A lot of organised research on the institutionalised basis was carried out.

—Educational research tended more and more towards scientific methodology.

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STAGES OF RESEARCH DEVELOPMENT IN INDIA

Origin of research of any kind in India can be attributed to the modern period of our history only. With the westernisation of our

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educational system and life in general and with the explosion of knowledge in advanced countries, the concept of research in the modern sense also originated in our country. Research in the fields of physical and natural sciences preceded that of social or humanistic sciences in India.

Although the universities were set up by about 1858 the attention of the university authorities was drawn towards research only in 1902.

The Period of infancy (1902—1921)

The universities turned their attention towards research for the first time but the research achievements were not very encouraging. The University Education Commission (1948) observed that organised efforts for research were not made till 1914. Rather, no organised attempt was made to train students in methods of research and to develop schools of research in any university.

In 1914, Sir Asutosh Mukherjee founded the first post graduate department at Calcutta University and placed post-graduate teaching and research on proper footing.

The period of organised approach (1922—1937)

During the period 1921—37, research work was organised by the Indian Universities on a far larger scale than before. This was done by (a) maintenance of libraries and research departments, (b) institution of research degrees (c) provision of scholarships and followships for research and (d) university bulletins and publications. In a way, research no longer remained an individualised isolated activity, it became a regular feature of the instructional programmes of the universities.

The period of international recognition (1938—1947)

As long as our universities were merely affiliating central bodies, only a small number of individual scholars at isolated colleges pursued research on their own sometimes with admirable results and immense inspiration for the students.

The research done during this period by many individual scholars in India was indeed praise-worthy and won international recognition. To cite some notable scientists of eminence, we can recall with pride the names of Jagdish Chandra Bose, P.C. Ray, C.V. Raman, & Megha Nath Saha. They brought honour to their country and inspired a large number of young scholars.

The Period of Maturity (1948 onwards)

University Education Commission (1948) has said—"**In a progressive society study of science has become an indispensable condition of civilized existence and a main factor in determining the direction of progress. Our country needs not only a constant supply of trained scientific workers but also scientific leaders filled with the spirit of research**".

Research development in India during the period has been outstanding in all important fields—medicine, agriculture, engineering, biological sciences, physical sciences, etc.

The establishment of Council of Scientific and Industrial Research, Post-Graduate Institutions of Medical Education and Research, Indian Council of Agricultural Research, National Council of Educational Research and Training, etc. are all examples of the developmental activities of research in the post-independence period.

While discussing research in education the University Education Commission observed—"The requirements for the Master's Degree in Education vary but normally include a piece of original work prepared under supervision. Besides these first steps by beginners in original work the staff of some training departments.........are seriously engaged in original work. There are also a few centres for advanced work in Education or Educational Psychology e.g. at the Government Centre at Allahabad, and at the University of Patna. The first attempt at educational research at the All India level is to be made by the newly founded Central Institute of Education in Delhi."

The commission did not express much satisfaction with the research work of M. Ed. candidates and that carried on by Professors and Lecturers of Training Colleges. It observed : "The original work by Professors and Lecturers in Education is sometimes of high quality, but it seems to suffer, so far, from isolation and lack of inter-university planning".

Some other developments towards educational research took place during this periad—

1. Establishment of Research Institutes, Bureaus and Advanced Centres.
2. Improvement of Research Libraries and Research Aids.
3. Programmes of Planned Development.
4. Instituting Scholarships, Grants and Other Aids.
5. Collaboration with Foreign Agencies.

National Council of Educational Research and Training, Delhi was set up as an autonomus organisation in 1961, to play the role of a central research bureau. The council is engaged in developmental programmes of Research, Training and Extension in the field of Education. It undertakes, promotes, aids and coordinates educational research, organises pre-service and in-service training and extension work and disseminates information regarding the latest educational techniques and practices. It sponsors or organises surveys of national importance and lays special emphasis on investigations of immediate problems in Indian Education.

The National Institute of Education is the main agency of the Council to realise search objectives. This institute is an integrated and inter-disciplinary complex of eleven departments and four Regional Colleges of Education.

In the States also there are numerous research bureaus and institutes either sponsored by the Central Government or the State Governments themselves. Some of such institutions are :

1. The Central Institute of English, Hyderabad.
2. The Regional Institute of English, Bangalore.
3. The Central Pedagogical Institute, Allahabad.
4. The Bureau of the Educational and Psychological Research, David Hare Training College, Calcutta.
5. The Indian Institute of Education, Bombay.
6. The State Institutes of Education.
7. The State Science Education Units.
8. The State Evaluation Units.
9. The State Bureaus of Educational and Vocational Guidance.
10. The State Councils of Educational Research and Training.
11. The Inservice Training Centres.
12. The Extension Departments, Units and Centres in selected Training Colleges in the Country.
13. The Departments of Education in Various Universities.

The National Five Year Plans have also made mentionable contribution in promoting educational research. For the specific purpose of promoting educational research in training colleges, the First Five Year Plan, earmarked in 1953-54 a large sum of money to start a special scheme under the name of Research Projects for Promotion of Research in Training Colleges. The scheme, in the first instance gave impetus to more than twenty training colleges all over the country. The Second and Third Five Year Plans have continued and expanded the scheme further to include more training colleges and other projects than those sanctioned in the beginning. During the first two plans, grants were given to teacher-training colleges and departments of education to conduct research mainly in problems connected with secondary education. In the third five year plan, the scheme has been working on a wider scale. The grants were to be given to any recognized educational institution which was considered competent to undertake a research project and the field of research was also to be widened so as to include problems connected with pre-primary, primary, basic and secondary education. The operation of the scheme has since been handed over to the N.C.E.R.T. which has set up a Standing Committee for the purpose. Besides, the Council has a scheme of grant-in-aid for research and publications in the field of Social Education and Libraries.

Several foreign agencies and schemes have also contributed in a substantial way to the cause of educational research in this country. Of these, mention might be made of the Ford Foundation, the British Council, the Institute of Education, London, the Commonwealth Student Exchange Programme, the UNESCO, Colombo Plan, and the U.S. Department of Health, Education and Welfare, to mention only a few. Expansion of educational research has been directly affected by international team of experts sent by the Ford Foundation to study the problems of secondary education in other countries of the world. The contributions of UNESCO are varied and significant. It has supplied us with experts, finances and equipment in many areas and activities of educational research.

Indian Council of Social Sciences Research (ICSSR) has also shared some responsibility towards research in the field of education. The council was established by the Govt. of India in Dec. 1968. Its main object is to promote social sciences, research and its utilization in the country. For this purpose, it reviews progress of such research, sponsors research programmes and projects, provides technical and financial assistance for them, indicates topics of research, coordinates research activities, develops documentation, organizes seminars and workshops and awards fellowships and scholarships. The Council has constituted a Research Projects Committee, a Research Survey Committee, a Committee on Documentation Services, and Committees on Research into Problems of Scheduled Castes and Scheduled Tribes. A major project undertaken by the Council was to carry out a survey of research done in various fields and social sciences, It publishes a quarterly newsletter and series of research abstracts and circulates in a mimeographed form Documentation News.

Some teacher's associations have undertaken useful research during the recent years. The names of South Indian Teachers' Union and the Indian Association of Teacher Educators may be mentioned as examples in this respect.

Some private bodies are also engaged in educational research. A few names are : The Bureau of Educational Research, Ewing Christian College, Allahabad ; the Sadhna School of Educational Research and Training, Bombay : the Indian Institute of Education, Bombay ; the Gujarat Education Society, Bombay.

Journals and Periodicals

Some of the major journals and periodicals, wholly or mainly devoted to reporting on research in Education carried out in the country are the following :

1. *Educational Abstracting Service*, Started by the Govt. of India. Publishes since 1955, a quarterly bulletin entitled the *Indian Education Abstracts*.

2. *The Indian Education Index*. By the Central Govt. A monthly subject index to a selected list of educational periodicals published in India.

3. *Abstract of Foreign Educational Literature*. Bi-monthly by the Central Govt.—The Documentation Services of the Central Secretariat Library, Ministry of Education.

4. *Indian Journal of Psychology*, published by the Indian Psychology Association.

5. *The Journal of Education and Psychology*—Quarterly by the Faculty of Education and Psychology, M.S. University of Baroda.

6. *The Indian Journal of Educational Research*. Was started in 1949 by the Institute of Education, Bombay.

7. *Educational and Psychology Review* Started in Jan. 1961, by M.S. University of Baroda. A quarterly publication.

8. *Teacher Education*, a quarterly published by the Indian Association of Teacher Educators.

9. *NIE Journal*—a bimonthly educational journal,

10. *Educational Studies and Investigations* by NCERT.

11. *Researches and Studies* by the Education Department, University of Allahabad.

12. *Studies in Education and Psychology*, C.I.E., Delhi.

13. *Research in Education*—Prantiya Shikshan Mahavidyalaya, Jabalpur.

14. *Studies and Investigations in Education*. Women's Training College, Dayalbagh, Agra.

15. *Educational Monographs*, Centre for Advanced Studies in Education, Baroda.

16. *Studies in Education*, Department of Education, Muslim University, Aligarh.

17. *Vidya Bhawan Studies*. Vidya Bhawan Teachers College, Udaipur.

18. *Abstracts of M.Ed. Dissertations*. Deptt. of Education, Kurukshetra University, Kurukshetra.

Recommendations of Indian Education Commission

It is worthwhile to take note of the recommendations of the I.E.C. with regard to the steps to be taken to improve the situation in educational research in our country.

1. If this picture is to be changed, urgent steps have to be taken to develop educational research and relate it effectively to the formulation of educational policies and improvements.

2. A documentation centre and a national clearing house in educational research should be developed at the N.C.E.R.T. ....

steps should be taken to organise periodical conferences of research workers so that their isolation is broken and educational research acquired a professional status.

3. Educational research has to be developed in terms of inter-disciplinary fields.........Schools of Education should be established in four or five universities. It will be the special responsibility of these schools to develop educational research in a big way in collaboration with other departments. For instance, socio-economic studies of their student body can be done by the deptt. of sociology ; studies in wastage and stagnation in their courses can be done by the deptt. of mathematics and statistics.

4. It is desirable to set up a National Academy of Education consisting of eminent educationists broadly on the lines of National Institute of Science, to promote educational thought and research.

5. We recommend that a strong Education Research Council should be set up in the Ministry of Education...: .....It should consist of representatives of the universities, training colleges, NCERT, State Institutes of Education and institutes interested in educational research and some educationists and educational administrators and planners. Its main function would be to distribute funds placed at its disposal for educational research and to bring out periodical reviews of its development for the information of all concerned.

6. As time passes, we expect that educational research will become more and more sophisticated. There is, therefore, urgent need to provide good specialized training for research work and services for data-processing, statistical analysis and consultation.

7. It would be the responsibility of the NCERT at the national level and the State Institutes of Education at the State level to bridge the serious gap between educational research and current school practices. A similar role will have to be played by the UGC in the field of higher education.

8. The total expenditure on educational research has to be increased considerably, the goal being to devote about one per cent of the State expenditure on education to it........no worthwhile project of educational research should be allowed to be shelved for want of financial support.

9. It is necessary to bring together officers of the Education Departments in the field with the research workers in training colleges and the universities. For instance, the Schools of Education which we have recommended, should make it a point to hold annual conferences of selected district education officers, headmasters of schools at all levels and teacher educators.

EDUCATIONAL RESEARCH ABROAD

By now educational research seems to have developed to a stage where the findings of one country in this field must have their impact on the educational systems of other countries.

The first International Conference on Educational Research held at Atlanta City, New Jersey, U.S.A. in 1956, discussed the problems of developing international collaboration in educational research. Only eleven countries participated in it. This was followed by another International Conference held at Tokyo in 1959, in which more than forty countries participated. They surveyed and discussed the status and problems of educational research in their respective countries. They attribute the failure of educational research in playing a major role in the establishment and development of educational systems to three likely causes, viz., lack of awareness of the need for educational research, and lack of faith in its results and lack of funds to support educational projects.

The International Bureau of Education conducted in 1965, an international survery to clarify the current situation in the field of educational research. The study demonstrated the need for international, governmental and non-governmental cooperation and coordination in every aspect of educational research. Exchanges of experts, scholarships for travel and study documentation and material, joint enquiries on similar problems enhance value and utility of research for educational progress.

It was found that in about 40 countries, the research was organized at administrative level. Most of the educational research was however being carried out by university faculties of education and higher teacher training institutions. In some countries, private bodies also played an important and even pioneering role in educational research. Some professional associations of teachers had also involved themselves in research. About forty countries made use of scientific methods applying current techniques of psychological diagnosis, educational psychology and experiments, about 25 made use of questionnairs, tests, etc. for making enquiries and 14 countries confined themselves to observations, inspector's reports and some practical tests. For dissemination of results, few countries had satisfactory documentation and clearing house facilities. Reviews devoted to educational research were few. As regards international action, 47 countries recevied international or bilateral assistance.

It will be worthwhile here to discuss the development of educational research in the prominent countries of the world.

Great Britain

The year 1888 is considered as the year of the origin of educational research in U.K., when Sir Francis Galton investigated into mental fatigue. In 1896, the Board of Education got interested, published special reports and created a sub-committee on *Psychological Research in Schools.* The development of direct educational research, however, took place from the second decade of the present century after Binet's invention of the Intelligence Scale in 1905. In 1920, the first issue of *Educatianal Research* was published by the London Head Teachers'

Association. A Committee for Research in Education was founded in 1922 by the British Psychological Society for Research in Education. In 1925, The Forum of Education (now incorporated in the British Journal of Educational Psychology) published an account of the Committee's work upto that date under the title *Progress of Research.* The years following have seen a steady development of educational research marked by three important features :

1. adoption of the techniques of scientific research evolved in psychological laboratories.

2. application of statistical methods of analysis to educational data.

3. the origin and development of mental testing and measurement.

The National Union of Teachers, the Local Education Authorities and the Education Committees worked in cooperation in the field. Many successful investigations on individual differences, group tests of attitude, interests and achievement using highly elaborate methods of statistical analysis have been completed. A Foundation for Educational Research was established in 1942 which prepared the way for the National Foundation for Educational Research. It is a partnership of corporate members i.e. local education authorities, associations of teachers, universities, colleges of advanced technology, the armed forces, etc. and is concerned with the study of problems arising within the national education system.

The Education Act of 1944 empowered the Minister of Education and Local Education Authorities to conduct and aid educational research.

The important journals and periodicals of educational research in the United Kingdom are :

1. British Journal of Educational Psychology—published twice a year.

2. British Journal of the Educational Studies, published twice a year.

3. Bulletin of the National Foundation for Educational Research in England and Wales, published twice a year.

4. Educational Research, published twice a year.

United States of America

The United States saw in the third decade of the present century the publication of *Ten Years of Educational Research* (1918—1927) by Walter Monroe who characterized the period before 1918 as the 'Pioneer Period' in educational research. Having its roots in the early years of the present century, educational research has developed steadily and rapidly ever since. In 1920 happened the establishment of the *American Educational Research Association* and the introduction of the *Journal of Educational Research*. Within a quarter of a century a wide variety of instruments for research and appraisal in education were published.

The Third Mental Measurement Year Book, published in 1949 lists 663 tests and 549 books on measurement and related subjects. This is the period characterized by the process of collecting, analysing and quantifying educational data.

The colleges and universities of the country have been carrying out many a research projects successfully. Review of Educational Research, started in 1930, publishes a digest of important research reports. Numerous papers, periodicals, monographs and books are published by various agencies every year on research in education. Important national bodies, organisations and depositories in this field are :

1. American Council on Education, Washington.
2. American Educational Research Association, Washington.
3. Educational Testing Service, California.
4. National Education Association, Research Division, Washington.
5. National Society for the Study of Education, Illinois.
6. Science Research Association.
7. United States Office of Education, Washington.
8. University Microfilms, Michigan.
9. City School Systems.
10. Institutes of Higher Learning.
11. State and Territorial Departments of Education.
12. State Professional Education Associations.
13. Clinical, Guidance and Testing Bureaus.
14. Foundations for the Advancement of Educations such as Carnegie group, The Rockefeller group, The Commonwealth Fund, The Ford Foundation Fund and The Kellogg Foundation.

Outstanding Research Journals and Periodicals on educational research in the U.S.A. are :

1. California Journal of Educational Research—published 5 times in a year.
2. Journal of Educational Psychology, Maryland, published 8 times a year.
3. Journal of Educational Research, Wisconsin, published 9 times a year.
4. Journal of Experimental Education, Wisconsin, published 4 times a year.
5. The Phi. Delta Kappan, Illinois, published 9 times a year.
6. Research Bulletin of the National Education Association, Washington, published 4 times a year.
7. Review of Educational Research, published 5 times a year.

It will not be out of place here to mention that even in U.S.A. professional people and critics are not satisfied with the research work being done by various agencies in the field of education. It has been remarked by B. Bloom that of the 70000 studies listed in the Review of Educational Research over the last 25 years, there are about 70 only which can be called crucial and significant, *i.e.* hardly about 3 studies in a year.

The U.S.S.R.

The rapid advancement in the educational system of the U.S.S.R. within the last couple of decades is no matter of chance. Systematic planning and scientific research in the field are at its back. Academy of Pedagogical Sciences, set up by the Soviet Government in Oct. 1943 carries out systematically a lot of educational research in fields including the history of education. special schools, teaching methods and psychology. It has been publishing since 1950, a quarterly bibliographical guide. The Academy works through a number of scientific research institutes mentioned below :

1. The Institute for the Theory and History of Pedagogy.
2. The Institute of Educational Methodology.
3. The Institute of Psychology.
4. The Institute of Artistic Education.
5. The Institute for Physical Education and School Hygiene.
6. The Institute for Training of Handicapped Children.
7. The Leningrad Institute of Education.
8. The Institute for National Schools.
9. Institutes for Educational Research and Institutes of Psychology.

Committees of experts distributed among nine important economic centres and usually attached to the education faculties of the main institutes of education are responsible for planning and organising the educational research in their respective areas. With the assistance of these committees. a council controlled by the Ministry of Education coordinates and guides the research work carried out at the Universities and at the Institutes of Education.

Australia.

In Australia, the Council for Educational Research was established as early as 1930. It not only collects, digests and interprets educational facts and statistics, but also seeks to promote research and investigations into problems of Australian education.

Some of the important contributions of this Council have been— the training of research staff, the development of tests, publication of significant research studies, the study of curriculum and standards of attainment in the various states, the periodical publication of the *Review of Education in Australia* and the study of new educational materials and techniques. To this Australian Council for Educational Research are attached *Institutes of Educational Research* in all the six states.

Commonwealth Office of Education is another important agency of educational research which conducts research and gathers and circulates information on such educational matters as have a commonwealth-wide application, *e.g.* teaching of English as a foreign language, technical education, teacher's salaries and service conditions, etc. Besides, the State Education Departments in all the six states maintain separate *research sections.* The faculties or departments of education in almost all the universities of Australia conduct research into significant problems of education in the country.

The following Research Bibliographies and Journals current in Australia indicate the extent to which educational research has been carried out in the country :

1. Educational Research being undertaken in Australia, published by the Commonwealth Office of Education is an annual feature.

2. Theses in Education and Educational Psychology accepted for Degrees at Australian Universities was published by she A.C E.R. in 1953.

3. A.C.E.R. Test News, published twice a year by the Australian Council for Education.

Canada.

Most faculties or departments of education in the Canadian Universities conduct some kind of educational research regularly. Besides, there are the following special research organisations.

1. *Alberta Advisory Committee on Educational Research.*
2. *Canadian Education Association.*
3. *Canadian Research Committees on Practical Education.*
4. *Canadian Teachers Federation—Research Division.*
5. *National Advisory Committee on Educational Research.*
6. *Ontario Institute for Studies in Education, Toronto.*

The three main periodicals on educational research are :

1. *Alberta Journal of Educational Research*—a quarterly journal
2. *Canadian Research Digest*—a quarterly.
3. *The Ontario Journal of Educational Research*—a biennial publication.

France.

In France, agencies of educational research exist at University, national and international levels. A *University Bureau* does research in vocational guidance at the secondary and higher education levels and issues various publications. The *National Institute of Pedagogy* functions as the national documentation and research centre. Then there is the

International Centre of Pedagogy which in liaison with the National Institute of Pedagogy, specializes in research work at the secondary level. As many as nine major research journals and periodicals on educational research are current in France.

Japan.

A large number of agencies are engaged in educational research in Japan. They are :

1. National Institute for Educational Research.
2. Federation of Societies for Educational Technique.
3. Institute for Science of Education.
4. Tokyo Noma Educational Research Institute.
5. Ohtomo Educational Research Institute.
6. Tanaka Institute for Educational Research.
7. Tokyo Educational Research Institute.
8. All Japan Federation of Special Educational Research Institute.
9. National Educational Research Association.
10. Institute for Special Educational Research.
11. The faculties of education of the Universities of Hiroshima, Kyoto, Kyusha, Tohoku and Tokyo.

An equally rich crop of educational periodicals includes the following :

1. Children's Psychology and Mental Hygiene, a monthly published since 1950.
2. Educational Techniques.
3. Educational Research.
4. Educational Psychology.
5. Studies in Pedagogy.
6. Institute Bulletin, and
7. Bulletin of the Research Institute of Comparative Education and Culture.

THREE

Research Needs in Education

A student of methodology of research in education ought to be aware of the needed research in his subject, areas of educational research or fields of educational research.

"The unsolved problems of education are so numerous and so varied that it is necessary to simplify a survey of them by using some rather arbitrary classification."—F.L. Whitney. The vast area of education can be subdivided into various specific, independent and demarcated sub-areas for the benefit of researcher.

We can classify the fields of educational research in a number of ways. For example, they may be classified under various stages of education—Infant Education, Primary Education, Secondary Education, and University Education ; or under various kinds of education—General Education, Technical or Vocational Education, Teacher Education, Physical Education, Special Education, Moral Education, etc. It is, however, more pertinent and convenient to classify the problems on the basis of various educational aspects, such as Curriculum, Syllabi, Aims and Objectives, Organisation, Administration, Equipment, Methods of Teaching, Guidance, Testing, Examinations, Evaluation, etc. Another classification can be drawn from the time-perspective of things. It may take the forms : Historical, Normative, Experimental, etc.

We can adopt any classification we may like to adopt, the crucial issues, urgent needs, serious problems, virgin fields and unexplored areas will emerge out as the uppermost items for the attention of research workers. The needs of research are therefore being discussed ahead under various sub-headings :

Research Needs in the Philosophy of Education

In the field of Philosophy of Education, there is need for working on the problems like this :

1. Charting out the various possible meanings of a concept.

2. Defining the senses in which it is used in different theories within a single branch of inquiry and also among the different branches of inquiry.

3. Studying the implications of their sense in various educational theories.

4. To examine educational generalisations, assumptions and theories borrowed from the behavioral sciences.

5. Undertaking an examination of the various value-approaches and thus formulate an adequate value-basis for the Indian Scheme of Education. In the present circumstances when we are beset with a value-crisis such a study would be of immense help in the reconstruction of the values of the Indian system of Education.

6. How to accommodate in the curricula the new and incoming knowledge is another problem especially when we cannot discard the past one. The solution of the problem requires a proper perspective and sense of proportion which a scientific study alone can yield.

7. When we accept or reject, partly or wholly, the western philosophical bases of education, we must examine the real differences between the Indian view and way of life and that af the West.

Research Needs in the Sociology of Education

1. There are certain important aspects of education like the formulation of educational aims and policies regarding the size of the educational stages, state-wise or district-wise educational planning, optimum size of a school or a class, the media of instruction etc.

2. The problems like the teacher's role as an agent of social changes, areas of socio-cultural lag in school education, factors curbing school teacher's freedom, initiative and creativity in India, teachers' morale, obstacles in the inculcatian of democratic, secular and international spirit in students, patterns of leadership training in schools, vocationalization of school education, sociology of class teaching, the impact of radio and T.V. on students, etc. also deserve to be investigated into.

3. Some other areas would be : attitudes, hobbies etc. of students and teachers, co-curricular activities, wastage and stagnation at the school stage.

Research Needs in Educational Psychology

1. One of the most urgent needs in Education is to study why there is such poor effort and such low output.

2. What we need today is 'power' research rather than 'status' research. The immediate need is to increase efficiency in teaching and learning rather than to delineate the features of the learner which

facilitate or retard learning. Research has to help the teacher to improve his effectiveness in the classroom.

3. The social forces outside the school involve the students so greatly that what the teacher does within the school tends to be immaterial. We must study the social forces which impinge on the students.

4. One of the most urgent tasks is to make a grade-progress study in each school and in each state as a whole. A survey has to be made to find out how many years a student takes to complete the primary and the secondary school courses.

5. Then there is need for research regarding the problem of readiness. Special readiness tests have to be standardised and systematically applied on a vast scale so that the teacher can do his task effectively.

6. Research is needed in special subjects particularly in reading, handwriting, spelling, arithmetic and the like. Significant work should be done in this area if we want any improvement in standards.

7. To judge the effectiveness of teaching machines for improving educational attainment is a fertile area for research.

8. Does bilingualism affect the growth of intelligence ? Is there any difference in vocabulary level between the monolinguals, bilinguals and multilinguals ? These are some interesting items for study in our country with so many languages.

9. There is need for standardizing general ability tests, special aptitude tests, achievement tests and interest inventories for each state with State and District norms available.

10. We also need many studies in creative thinking so that we can help the teacher and students to play their part adequately and effectively in social and economic progress.

11. As regards evaluation and examination, considerable work has been done. There is need to do some work to find out the best means to help the student to do self-evaluation. Marking and grading systems also stand in need of research scrutiny.

12. Another big sub-area is the education, development and adjustment of exceptional children.

13. Studies are also necessary in the field of rehabilitation of handicapped children and the problems they face in society and on their jobs.

14. Substantial work has already been done on delinquents and there is still greater need to pursue investigations in this area.

15. The very concept of discipline has to be clarified so that

hypotheses could be developed and tested. We have to view the problem of discipline as a group problem. We need studies regarding group structure and leadership, and studies in the group-decision processes.

16. An area in which vital studies are necessary is that regarding social development. Failure of national integration, for example, should be taken up as a scientific challenge.

Research Needs in the History of Education

Research needs in any branch of knowledge, especially in a social discipline where no finality is possible and where there is no restriction to repeat the same project a number of times, can be limitless.

The whole case of need of historical research in Education can be viewed from two angles at the very outset. One, the limitations of the work already done in the field of history of education and its requirements. Two, some important current socio-economic-cum-educational problems and objectives which need immediate attention. Some important issues can be enlisted as under :

1. Instead of macro-studies covering long periods, of the whole of India and all aspects of education as have been attempted hitherto, some micro-studies covering small periods, small regions and specific aspects of history of education are needed.

2. A careful examination is also over-due regarding the evolution of rigid caste structure and its role in educational development.

3. To throw light on the educational policy of different kings in different parts of ancient and medieval India, and towards different communities.

4. An educational history of post-independence period, which honestly presents the failures and successes on the educational front, is also needed.

5. The influence of some new economic trends, created by new administration, permanent settlement, commercial and industrial processes and the like on education also needs to be studied.

6. History is regarded as a backward projection of the present situation and it helps us in viewing the present situation in its origin and growth. So one major need in the discipline is to study the present day educational problems historically rather than studying the past periods in isolation.

7. Only a historical probe can expose the cause for the continuing heavy wastage and stagnation, the continuing apathy of some castes and adults towards education and a number of other forces and pressures which impede progress.

8. Some other areas are, government control on Education.

Education of the weaker sections, historical evolution of public schools with their social structure, religious bodies and education, etc.

9. There is need to understand what was the relationship between the growth of education and agriculture. What was the relationship between secondary and univeristy education on the one hand, and industrial development on the other. History can be written which should study the relationship between the growth of education in India and vocational trends.

Research Needs in the Theory of Education

Theory of Education as a potential field of research has failed to attract the attention of the researchers in India and foreign countries. It is due to misfortune of our times that research is guided by men who look upon research worker as an inventor of gadgets and a finder of odd and peculiar facts. This policy might have produced local answers to local problems. There is no evidence, however of researches of higher level, of theoretical nature or of fundamental nature.

Advanced studies in Education generally turn into philosophy, psychology or history of education. We do not have as yet a set of basic concepts, uniquely educational, that can serve as a foundation for significant researches in Theory. Thus the initial task before a researcher of educational theory would be just to enlist the basic concepts, their meanings, scope, implications etc. in the field of education. He has to search for the theory and principles of his discipline. We must by all means take up problems at the economic, social, sociological and allied levels. But conclusions reached from the above researches have to be bound together into significant and meaningful wholes by our insights gained from the deep study of aims of education and higher values of life. Research scholars in educational theory should aim at upholding and re-interpreting the lofty traditions of our culture. Science, inspite of its best methods is not competent to touch even the fringes of the realm of values. The lofty experiences generated by the pursuit of values are beyond the reach of the scientist.

Research Needs in Comparative Education

1. It will be a valuable piece of research to make a horizontal and vertical study of democratic decentralisation in various countries of the world and various states of India.

2. Administrative pattern of the Departments of Education in various countries and various states.

3. Inter-state study in the grant-in-aid system.

4. The role of voluntary agencies in providing education in various places, countries and states.

5. Examination reforms and certain other progressive measures have been introduced all over the world. It is time when a comparative evaluation of their success can be made.

6. A comparative study of the problems and procedure of text-book production, the extrinsic and intrinsic qualities of the text books produced at various places.

7. Inter-state or even inter-district educational phenomenon in relation to organisation, finance, curriculum, availability of teachers, school buildings, etc.

8. It is interesting to find out variations caused in the system of education as a result of geographical, cultural and other factors.

9. It will be a valuable research to prepare case-studies of some institutions in similar and dissimilar cultural and environmental settings.

10. Some study conducted in a foreign country may be repeated in the local setting and the results may be compared.

Research Needs in Curriculum

Since, the world war II, there has been a universal demand for curriculum reform. This has led to research in curriculum change and curriculum development through the Universities, Departments of Education, or special bureaux of curriculum studies. It is believed that fundamental and lasting improvements in Education can take place when teachers, parents, lay and professional groups, as well as educational officials work together to revise and improve the school curriculum. Secondly, a school curriculum will be effective in so far as it is based on adequate knowledge of how children grow and learn and of the needs of the modern society. The latter is a matter of public relations and the former of research. So far as curriculum theory is concerned there are hardly any publications yet available in our country. No attempt seems to be made to develop a curriculum theory based on Indian educational thought. There are no professional organisations at any level in India devoted to create a consistent thought on Curriculum Development exclusively through annual deliberations or expert committee reports on curriculum problems that our country faces. The research in curriculum needs to be focused on the following issues :

1. Is it designed in tune with the philosophy of education in our country ? If not, what changes are needed for its orientation ?

2. How can it be diversified to meet the individual differences of pupils in view of their stage of development and range of interests and aptitudes ?

3. How can it be related to the needs of developing nation and the manpower requirements of our country ?

4. How can it remain flexible and dynamic in content ?

5. What are the principles of making the curriculum balanced in theory and practice or in compulsory and elective courses ?

6. What kind of preparation and training is required for teachers to make the curriculum a meaningful experience for pupils ?

7. What is to be learned and what are the uses of various elements of the curriculum ?

8. What should be the methods in curriculum making ?

9. How should the provisions be made in the curriculum for the individual.

10. What is the bearing of psychology on the curriculum ?

11. What is the relative importance and suitability of each course of study ?

12. What type of curriculum is required by law and other outside agencies ?

13. What is the optimum number of subjects to be studied simultaneously by a pupil ?

14. What type of instruction should be compulsory and what optional ?

15. What are the future needs of pupils as far as curriculum is concerned ?

16. Testing experimentally all principles of curriculum construction.

17. Curricula in education that will produce better results in morals.

18. To investigate into the sources of curriculum content.

Research Needs in Educational Administration

1. Role analysis of educational administrators at different levels.

2. Comparison of roles of administrators in education, business, government and other social institutions.

3. Studies in values and attitudes of educational administrators.

4. Case studies of administrators in education.

5. Finding impact of specialized training on administrative behaviour.

6. Tests for measuring mental health and aptitude of educational administrators.

7. Criteria for selection, recruitment, and appointment of educational administrators to various specialized jobs.

8. Measuring impact of physical facilities and working conditions on administrative behaviour, efficiency and success.

9. Influence of culture or cultures on administrative behaviour.

10. Studies in morale of educational administrators.

11. Democratic values and appropriate administrative leadership in education.

12. Group dynamics and its impact on administrative behaviour.

13. Forms of organisation (line and staff), methods of control (centralization and decentralization) and their impact on educational administrators.

14. Community power structure, internal politics, informal and formal groups and their influence on educational administrators.

15. Administrator's personal philosophy and its impact on his administrative behaviour.

16. Analysis of the administrative process suited to educational system.

17. Studies in decision making process in education departments, schools, colleges, and universities.

18. Factors or criteria of effective decision-making in education.

19. Effective planning by educational administrators.

20. Methods of planning (individual or group, rational or irrational, realistic or theoretical) and their impact on educational administration.

21. Staff participation in educational planning and administration.

22. Forms of organisation, organisational structure and hierarchy and their impact on the administration of education.

23. Delegation of authority and responsibility in educationa administration and their impact.

24. Significance of communication in effective educational administration.

25. Studies in the use of community resources by educational administrators at various levels.

26. Studies in staff relations maintained by administrator within their institutions.

27. Measures for evaluating the outcomes and returns of educational administration.

28. Studies in problems and difficulties faced by the departments of education, inspectors, headmasters and managements.

29. Studies in supervisory and inspection procedures in education.

30. Studies in the administration of teacher welfare programmes.

31. Administration of medical inspection and remedial programmes.

32. Administration of maintenance services in schools and colleges.

33. Studies in morale of subordinates working under educational administrators.

34. Studies in coordination among different administrative units or groups involved in education.

35. Analysing concepts like educational administration, inspection, supervision, school management, administrative behaviour, human relations, leadership and so on.

36. Historical studies in the development of administration in education at various levels.

37. Documentary analysis of administrative policy, laws, and codes with reference to education and its development.

Research Needs in the Financing of Education

The central government collects statistics of education in Form A which covers the entire field of education in the States and Union Territories, and Form B which deals with information of the universities and their colleges. They collect the figures of direct expenditure on boys and girls institutions separately and indirect expenditure on all institutions collectively and the total expenditure on the institutions meant for the handicapped. These available statistics of educational expenditure are so deficient that they cannot be usefully employed for any accurate investigation or planning. The data collected pertain only to the institutions. They do not include the full cost of education being imparted to the student, parents and the community. They exclude the expenditure incurred on the Secretariats of the States, Education Departments, Union Ministry of Education, and various other central bodies like the University Grants Commission, Council of Technical Education and the like. On account of these deficiencies, no accurate and comprehensive unit cost studies can be based on them. The item wise details of direct expenditure are not available except for one item, the salaries of teachers for different types of institutions. The data for indirect expenditure like that on buildings, direction and inspection, hostels, etc. is given in the form of a consolidated figure for all types of institutions and all branches of education.

The government reports are the only authentic sources of educational expenditure in the country. Attempts to get the details of data from the State or District offices of education involve difficulties and waste of time and energy and often the data are not dependable as they have not been reconciled and audited. That incidentally explains the time-lag in the publication of educational reports. These limitations on the availability of detailed statistics of educational finance circumscribe the scope of investigations and indicate that much patience and perseverance is necessary to pursue research in this field. Some of the suitable items for research in this area are hereby enlisted :

1. Detailed surveys of growth of educational expenditure during the post-independence period in the States ; proportion of public expenditure on education and comparison with proportion spent on other services, comparative study of salary scales of teachers, the contributions of the local bodies and local communities, role of philanthropic organisations and private agencies, school deficits, education cess, state procedures of financing education, pattern expenditure in urban and rural areas, capital costs, etc.

2. Besides the cost per pupil in various categories of institutions, unit costs of buildings, of furniture, of equipment, of health service, of direction and inspection, of mid-day meals, etc. may be found out.

3. There may be trend studies to investigate into the increase and decrease of population, enrolment in schools, and consequent expenditure on education over a period of years. The variation in public expenditure on education, its proportion to national income, its comparison with expenditure on other social services, and the pattern of allocation to various sectors within education itself reveal interesting trends in financing education. The effect of war, economic depression, rising costs of living and variation in pupil-teacher ratios on educational expenditure can be rewarding studies. The trends of financing education in Five-Year Plans and their effect on educational developments will suggest the improvements in this respect to be made in drafting future Five-Year Plans.

4. These trends may lead to projective studies in which estimates of future educational costs may be prepared and used for prospective planning of education.

5. In the aspect of grants-in-aid for education, the studies can be undertaken on the bases for grants, modification of the procedure for grants-in-aid to ensure speedy disposals, various types of grants, comparative study of grant-in-aid codes in various states, etc.

6. The provision of buildings, equipment, and furniture is a major problem for our educational institutions today. Extent of resources in the form of public funds, community cooperation, pupic effort, loans from some agencies like L.I.C. may be explored. Studies in cheap cost of construction and standard plans for various categories of buildings may be undertaken.

7. There is need for the survey of students aid and concessions like stipends, scholarships, fellowships, fee concessions, free books, loans, travel subsidies, etc. The rules of these aids and concessions.

be examined from time to time in the interest of the student community.

8. The maintenance of cash book, financial records, contingency register, stock register, and day book used in the school may be scrutinized and improved methods suggested. What bases are the schools using for budgeting and what should be the bases for estimating and calculating school costs ? A scrutiny of the distribution of school funds will help in more effective use of resources.

9. Disparities of facilities between states, regions, rural and urban areas, sexes, and advanced and backward communities should be discovered and more equitable distribution of resources should be suggested to remove inequalities.

10. Cost-quality studies will also be of interest. Investigations may be made into the financial implications of introducing new teaching techniques, audio-visual aids, television, radio, seminar and tutorial systems for quality improvement and compared with conventional methods.

11. Some criteria should be developed to assess the out comes of financing education in respect of efficiency, effectiveness, productivity or educational returns.

12. An investigation may be made into the underlying principles in the control, and conduct of educational finance for preventing wasteful expenditure, adopting economy measures and intensive utilization of funds.

13. Out of school expenditure in rural and urban schools boys and girls institutions at various stages of education may be assessed.

14. Opportunity costs is a new idea introduced by the economists in educational accounting. It is the income which would have been earned by the students if they had engaged themselves in some producuctive activity instead of attending the school. These foregone earnings should be added to arrive at the total expendirure on education. It may be interesting to study : what are these costs and what earnings keep them away from the schools.

Research Needs in Economics of Education

Research in the field of Economics of Education in a developing country is particularly rewarding since education plays a pivotal role in social and economic change. The developing economies can hardly give the needed priority to education. The major objective of research in this area is to apply the relevant economic analysis to the field of education with a view to

(*i*) raise the efficiency of educational system at various levels,

(*ii*) identify the direct and indirect role of education to social and economic development of the country and the future roles with varying rate of growth,

(*iii*) to prepare a short run and a long run prospective plan for educational development in the country, integrating educational plan with the general economic planning, and

(*iv*) to apply financial prudence of the economist in matters of raising revenues and incurring expenditures for educational development. Obviously research projects will have to be developed along these four aspects. Some other issues are :

1. Pricing the output of Education and estimation of Productivity of and efficiency in Education.
2. Estimating the impact of inflation on educational inputs.
3. Economic analysis of different techniques of teaching.
4. Constructing indices to measure the inputs and outputs of education.
5. Measuring non-economic benefits from education.
6. Allocation of resources to be determined whether by consumption demand or investment demand.
7. The role of education as a factor in income distribution.
8. Demographic trend, i.e., increase in population and consequent increase in school-going children.
9. Shifts in family incomes and value-structure of the parents in respect of the education of their children.
10. Changes in national income and percentage of national income being spent on education.
11. Targets in education.
12. Manpower approach to educational planning.
13. Economic analysis into the wastage in education.
14. Should we have a large number of poor institutions or a small number of quality institutions in view of our limited resources.
15. Evaluation of vocational and job-oriented courses.
16. Evaluation of work done by voluntary organisations.

Research Needs in Educational Measurement and Evaluation

Much controversy centres round the adequacy of the prevalent method of examination. In our examinations, many superfluous factors influence the marks the student gets. Everyone feels that there should be some change in the entire examination system. Improvements can be brought about by research work on the following issues and implementation of the results obtained :

1. Construction and standaradization of achievement tests for various subjects at different levels.

2. Characteristics of tests for achievement, aptitude, intelligence, adjustment, etc.

3. New type tests and their superiority over the traditional examination.

4. Problems relating to marks, pupil placement, diagnosis, remedial programmes, etc.

5. Training teachers in making and using tests.

6. Tests which will measure outcomes other than factual elements.

7. More reliable norms.

8. Diagnostic reading and writing tests.

9. Tests for better prediction of success.

10. Construction of short-term or unit tests.

11. Problems relating to measurement of efficiency.

12. Improvements in the essay-type examination by enhancing their objectivity.

13. Tools for assessing various personality factors.

14. Comparative studies of objective type and objective based tests.

15. Comparison between the new type tests, short answer type tests, essay tests and oral tests in respect of their effectiveness.

16. The causes of mass scale copying in our examination and trying some corrective measures.

17. Comparative study of open book type and supervised type of examinations.

18. Eliminating the chance factor from the traditional examination.

19. Evolving objective schemes of marking.

20. Comparative study of periodic tests, classroom tests and terminal tests.

21. The students, parents', teachers' and educationists' attitude towards examination.

Research Needs in Test Development

1. Objective selection tests for college admissions are likely to be in demand as educational opportunities are progressively made equal for all.

2. The industries as well as the State will need objective aptitude tests for jobs like clerical, management, mechanical and the like.

3. Individual scale of intelligence—child and adult.

4. Group tests of intelligence and aptitude.

5. College selection tests.

6. Selection tests for admissions to professional courses.

7. Personnel selection tests.
8. Personality tests—individual and group form.

Research Needs in Educational and Vocational Guidance

1. What is basically 'human' or universal in individual psychology and what is just the product of particular cultural conditions.
2. The effect of joint family in vocational adjustment.
3. The influence of widely different religious beliefs and attitudes on vocational choice and adjustment.
4. How can mere job information be presented so as to be most useful, and least harmful ?
5. Are interests and ambitions in line with actual abilities ?
6. Factors which lead to success in various professions, jobs in industry, business, Govt. service and so on.
7. Greater validity of the internal records of periodic examination over the annual examination for guidance purposes.
8. What sorts of factors lead to the best career choices ?
9. Cross-validation of various tests.
10. Factor analysis of aptitudes and achievement.
11. Survey of guidance services in our educational institutions.
12. Determining guidance-mindedness of different functionaries in education.

Research Needs in the Education of Exceptional Children

1. To ascertain the extent of the incidence of physical handicaps, defects and deformities and the types thereof.
2. To find out ways and means to help handicapped children.
3. To locate the cases of various degrees of retardation.
4. To ascertain the possible causes of mental retardation in children.
5. Proper means of educating the retarded.
6. Handling the socially handicapped or the delinquent children.
7. Programmes and techniques for the rehabilitation and follow-up of the socially handicapped.
8. Identification of the gifted and exploring their specific gifts and special aptitudes.
9. Evolving programmes of intensive and extensive guidance for the gifted so that they can make their greatest contribution.
10. Adjustment problems of the gifted students.

Research Needs in Adult Education

The research needs in the field of adult education have to be addressed to adult educators, sociologists, anthropologists, social psychologists, linguists, learning theorists and communication specialissts. Some of the areas of research would be :

1. The sociological analysis of adulthood.
2. What does it mean to be a child, an adolescent, an adult or an old man in India ?
3. Operationalisation of the concept of adulthood.
4. Psychological and sociological correlates of ageing.
5. Demographic questions like ; How many adults do we have ? Where do they live ? What are their socio-economic conditions ? What are their aspirations ? What are their most acute social, psychological and economic deprivations ?
6. The problems of participation of various kinds of adult groups in adult education programmes.
7. Problem of creating motivation in adults for adult education.
8. What are the chances of legislated literacy and adult education ?
9. Does the accompanying commitment about adult education exist in our country ?
10. What programmes comprise adult education ?
11. What groups need what kind of programmes ?
12. Can the Indian school as an organization absorb the new functions of adult education ?
13. What new administrative and instructional roles are needed for adult education work and what kind of training should we design for those roles ?
14. How is an adult educator different from a primary school teacher ?
15. What are the problems in the institutionalisation of adult education ?
16. Case studies of government and voluntary organizations of adult education in India.
17. The methods and materials of adult education.
18. What is a good primer for an adult ?

Research Needs in Elementary Education

1. The problem of providing elementary education to small villages or habitations.
2. Studies of non-attending children.
3. Causes of non-enrolment and the methods overcoming them.
4. Nature and causes of absenteeism in elementary schools.

5. To eliminate or reduce to the minimum the twin evils of wastage and stagnation.

6. The possibility of part-time education at the elementary level.

7. Curricular and special methods of teaching for part time education.

8. Problems relevant in the case of girls and children from the weaker sections of the society.

9. Possibilty of educating the handicapped children in the existing schools.

10. Understanding the social, economic and academic life of the elementary school teachers, their motivations and common difficulties.

11. The methods of selection or recruitment of teachers.

12. Determining the qualities that make for successful teaching at the elementary level and evolving objective tests for their measurement.

13. Assessing the efficiency of the teachers before and after training.

14. Different aspects of the service conditions of the teachers.

15. Devising curricula, teaching methods and reading materials for the elementary level students.

16. Longitudinal studies of children from birth to 18 years of age.

17. Preparing standard vocabularies in all the Indian languages.

18. Guide books for teachers.

19. The problems of single teacher schools.

20. Developing reading interests of children.

21. Building costs in elementary education.

22. Developing health services for elementary schools.

23. The community centre of a primary school.

Research Needs in Secondary Education

Our survival is dependent upon our ability to generate and capture ideas. New areas of research in secondary education can be enlisted as follows :

1. Studies of adolescence are of prime importance.

2. Whether the system of secondary education truly exemplifies the basic democratic traditions and beliefs of the Indian people.

3. The nature of the development of secondary education in

India may be better understood by comparing and contrasting our programmes with the programmes of some of the other countries of the world.

4. Changes in secondary education vis-a-vis changes in educational objectives.

5. Needed diversification towards the end of secondary education.

6. Tools for diversifying students.

7. Culmination of formal education at the end of secondary stage.

8. Vocational and pre-vocational courses at the secondary stage.

9. Crucial role of guidance services at this stage.

10. Student involvement in various co-curricular activities in order to channelise his energies.

11. Habit formation, character development and personality development at the secondary stage.

12. Relationship between aspirations and possibilities at this stage.

13. Student unrest in secondary schools.

14. Reading interests of adolescents.

Research Needs in General

Some general problems for research may be mentioned to have an idea of additional research possibilities.

1. Setting up the criteria for effective radio education.

2. Studying the limitations and adverse effects of radio education.

3. Areas in which radio education will operate more successfully.

4. Supplementing radio instruction.

5. Applying the laws of learning to radio education.

6. Investigating into the relative effectiveness of radio programmes.

7. History and possibilities of radio education.

8. Study of the employment situation and the unemployment of the educated.

9. Differences in achievement resulting from innate capacity and environmental influences.

10. Revamping the whole programme af teacher training in terms of skills to be attained.

11. The classification of fundamental principles and functions of the high school, college and university.

12. The improvement of teaching, methods in colleges.
13. The development of teachers' associations.
14. Coordination of all agencies in education.
15. Extension Education, inservice orientation courses and professional growth of the teachers.
16. Policies, programmes, problems and possibilities of women's education.
17. The working of shift system in schools.
18. Comparative study of ordinary, model and public schools.
19. Supervisory services in various states.
20. Analysis and improvement of textbooks.
21. Organisation of school meals.
22. Maintenance of cumulative records.
23. Follow-up studies of old students.
24. Students' welfare schemes.
25. Requirements of skilled and trained manpower.
26. Educational autonomy.
27. Home work and study habits.

* * *

FOUR

Research Problem

One of the most difficult phases of any research project is the choice of a suitable problem. The beginner is likely to take a very long time in making his choice. In this first step of any research the research worker should not take a hasty decision. Every problem which comes to his mind or even that suggested by a more experienced person may not be a fit research problem. The identification of a good research problem should be considered a discovery in itself.

Problem Blindness

The beginner in research suffers from a big misconception. After his preliminary study of research literature comprising of numerous theses completed every year, research bulletins, research abstracts, research journals, research publications, etc. he thinks that most of the problems of education have already been studied. Thousands of research studies are accomplished and published every year. Almost every significant problem has been studied not by one but many of his predecessors. He finds that any problem which comes to his mind or is suggested by someone else has already been studied enough. There is no problem-area which may be rightly called unexplored. Thus most of the beginners in research suffer from "problem blindness."

No Dearth of Problems

But we should not forget that the complex phenomena of education is full of innumerable problems. Human nature is so complicated a phenomenon, that a problem solved for one individual may still exist for another individual or a problem solved for one class may remain a problem for the class to come or a problem solved for one school will not automatically vanish from all the remaining schools or the problem solved by one teacher in his situation may continue to harass the other teachers or a problem solved in one system may remain persisting in another system or a problem solved for the time being may reappear with a lapse of time.

In the field of education, we have to deal with a host of variable factors in terms of pupils, teachers, parents, communites, curricula, text books etc. The interaction of these unstable variables in the complex phenomenon of education creates new situations, new permutations and combinations, new demands, new difficulties and new problems from moment to moment.

More and more of research does not mean that after some time or by a certain date all the existing problems will be solved for ever and there will be no more problems to solve. Rather it so happens that application of one remedy may cure the present malady but may leave behind many side effects which may turn out to be more serious and dangerous than the original malady.

Advancement of knowledge through research awakens and enlightens us towards new problems of which we were not aware and conscious before. As a matter of fact, increased knowledge in a given field reveals many new problems pressing for solution.

It may be stressed once again that every child is unique and has no duplicate in the past, present, or future. No amount of research will enable us to generalise finally about all children for all times.

The problems lie everywhere around us. They even lie at our door step and in our back yards. Let us develop in us problem awareness, or problem consciousness in order to locate and recognize them.

How to proceed

In the dicovery of his proplem, the investigator can take the help of the following procedure. This procedure can save him from wild search and aimless wandering.

1. He should select his field of specialization and become a scholar in that specialization as early as possible.

2. He should develop a concern for that field.

3. He should study critically the available research literature on one's field of specialization.

4. He should accept the difficulties or obstacles of that field as a challenge and try to exercise his originality and ability to tackle them.

5. He should prepare a record of problems already studied by others in his area of specialization.

6. He should acquaint himself with the research under way in that area.

7. He should analyse the trends in his field of specialisation.

8. He should acquaint himself with the possibilities, commitments and prophecies in that particular field.

9. He should widely discuss any problem that comes to his mind.

THE SOURCES OF PROBLEMS

But where to look for a significant and genuine research problem? The most likely sources to which one may turn are as under :

1. *The class-room, school, home, community and other agencies of education* are obvious sources. Many of our prevailing educational practices are based on little or no research evidence. What is known about learning and teaching is still inadequate. There is need and scope for performing the daily teaching tasks more effectively.

Many of the problems observed in the classroom, the school or the community are of greater importance, than those more remote from the teacher's experience. John W. Best has remarked—"Teachers will discover acres of diamonds in their own backyards, and the possessor of the inquisitive and imaginative mind may translate one of these problems into a worthwhile and practicable research project." The research worker should therefore search for his research problem in the immediate surroundings.

2. *Social developments and technological changes* are constantly bringing forth new problems and new opportunities for research. The development of commercial and educational television is a new factor in the field of education. How will it alter the rcle of the classroom teacher has to be decided on the basis of careful research. The unemployment of the educated and allround corruption are some social factors which are upsetting the steady programmes of education.

3. *Rocord of Previous Research.* Such specialised sources as the Encyclopaedia of Educational Research, Research Abstracts, Research Bulletins, Research Reports, Journals of Educational Research, Dissertations and many similar publications are rich sources of research problems.

Text book assignments, special assignments, reports and term papers will suggest additional areas of needed research.

4. *Discussions.* Classroom discussions, seminars and exchange of ideas with the faculty members and fellow scholars and students will suggest many stimulating problems to be solved. Close professional relationships, academic discussions and constructive academic climate are especially advantageous opportunities.

5. *Questioning Attitude.* A questioning attitude towards prevailing practices and research-oriented academic experience will effectively promote problem-awareness.

6. *Consultations.* Consultations with an expert, research supervisor, research guide, a course instructor or a senior scholar will also be helpful Several writers have ridiculed the student who expects the guide to

assign a problem. Although research problems should not be assigned or they should not be proposed and allotted by a guide but consultation with the more experienced faculty member or research worker is a desirable practice.

To expect the beginner to come to the guide with a completely acceptable problem is quite unrealistic. One of the most important functions of the research guide is to help the student clarify his thinking, achieve a sense of focus, and develop a manageable problem from one that may be vague and too complex.

CRITERIA OF A GOOD RESEARCH PROBLEM

Before the proposed research problem can be finalised, several conditions and considerations have to be satisfied. Although there are no standard rules that will guarantee the suitability of a research problem, a number of criteria in the form of conditions might be listed for guidance in the selection of a topic.

1. **Novelty.** It should be sufficiently original so that it does not involve objectionable duplication. Originality is the basic credit point of any research. Ignorance of prior studies may lead a student to spend time on a problem already investigated by some other worker. Moreover the study should employ the most recent data.

While originality is an important consideration, the fact that a problem has been investigated in the past does not mean that it is no longer fit for study. There is constant need for verification of the findings of previous investigations, using newer and better devices and procedures. There is also a need for the testing of former findings under changed cultural conditions.

2. **Interesting.** The problem should be interesting for the investigator himself. If he is not interested in it, he will not be able to face and overcome the obstacles which come at every step in research. He should have a strong inherent motivation for it. If it seems to him dull and boring, there is little hope that he would do justice to it. Interest may also sometimes develop with long familiarity, but it is not likely that the student can do his best work on a topic that has no personal meaning for him. A major reason for encouraging a worker to select his own research problem is that the results should prove better in terms of the growth of the investigator and the quality of his work.

His interest should be purely intellectual and should not be there only for a reward, material benefit, advancement in position, increased authority and so forth.

3. **Importance.** It should be significant enough and involve an important principle or practice. If it is not worthwile, if it neither adds to knowledge nor leads to any improvement in the current practices, it would be in vain. It should add to the development of

Education as a discipline and to the previous research findings in any way. No research project should be undertaken unless its consequences give promise of improving significantly an important educational practice. The difference between the significant and nonsignificant project lies not in the amount of work required in the case of the former but the amount of thought involved.

4. **Feasibility or amenability**. The next question to be asked is that whether research into the problem would be feasible. The suitability of the problem for a particular research worker is the matter of its feasibility. It may be a very good problem, but it should be good for the investigator. He should be able to carry it through to a successful conclusion. He should possess the required competence, knowledge and understanding. He should be skillful enough to develop, administer and interpret the necessary data-gethering devices and procedures. He should possess a reasonable grounding in the necessary statistical techniques. He should be competent enough to carry out all the steps of his project. It should match his special qualifications, training and experience.

5. **Availability of Data**. The research worker should ensure the availability of valid and reliable data-gethering devices and procedures. In case the study demands a confidential, sensitive and classified information, will it be possible for him to obtain it ?

6. **Availability of Cooperation**. The study may require cooperation from various institutions, authorities and individuals. It may need administration of tests to pupils, interviewing employees, observation of students at play, meeting the citizens, writing for data, going through records, conducting necessary experiments and going into prolonged study of exceptional cases. The investigator must make sure that necessary permission and cooperation will be readily available.

7. **Availability of Guidance**. Will I get necessary sponsorship and guidance ? Is there an adequately qualified member of the faculty who would be willing to guide the research worker ? Every research activity needs the patronage of a guide and the approval and sanction of a competent authority.

8. **Availability of other facilities**. Will I have the necessary financial resources to carry out the study ? The investigators should be able to meet the expenses involved in data-gathering equipment, printing, test materials, travel, computerisation, clerical help, postage, preparation of the report, etc. If the project is expensive in nature, he will explore the possibility of obtaining financial help or grant from some agency.

Will I have enough time to complete the project ? Selecting a problem, library study, preparing the data-gathering devices, collecting and analyzing the data, writing the research report, etc. are all time-consuming processes. Most of the research programmes impose time limitations. Certain worthwhile studies of a longitudinal type are therefore out of question.

9. **Immediate application.** Will my research help in solving an urgent problem ? Supposing I choose to work on eradication of unfair means in the examinations, how far my rerearch will solve the problem in hand ? It is quite obvious that I would be completely wasting my research effort on this problem which is likely to defy every solution.

10. **Aim of Research.** The aim of research also influences the selection of the problem. If it is producer research, the problem will be studied to enhance existing knowledge for its own sake. If it is consumer type, the results should be fit for immediate application.

11. **Level of Research.** It is another criterion to help in the selection of a problem. The nature and scope of a study will be determined in the light of levels like. Master's Degree, M. Phil. Degree and Ph. D. It may simply be an action research or a research to produce a research paper or an experimental project.

12. **Experience and Creativity.** Good research problems stem from a clear understanding of the theoretical, empirical and practical aspects of the subject derived from personal experience and from a thorough review of the literature. Conversely, lack of familiarity with the subject is almost sure to result in a poor choice.

Another major contributor to the wise choice of a problem is creativity and the other personality factors that make for originality, flexibility, initiative, ingenuity and foresight. Thorough familiarity with a given field is conducive to original thinking.

13. **Courage and Confidence.** Will I have the courage and determination to pursue the study inspite of the difficulties and social hazards that may be involved. Will I be able to work aggressively when data are difficult to gather and when others are reluctant to cooperate ?

Will I be willing to risk the criticism, suspicion or even opposition that a delicate or controversial study may raise ? Sex education, religious education, communism and other controversial problems are almost certain to stir up emotional reactions.

A GUIDE TO JUDGE A RESEARCH PROBLEM

Various authors have enlisted a number of questions to be asked while finalising the selection of a problem or judging its merits. A composite list of these questions is given below :

1. Is the problem really important ?
2. Does the field appeal to my interest ?
3. Is the problem interesting to others ?
4. Does it display originality and creativeness ?

5. Does the field require extension of inquiry beyond the present limits of verified knowledge ?

6. Am I really concerned with finding the answer ?

7. Is the field pivotal or strategical from the standpoint of the immediate purposes ?

8. Is the problem feasible with respect to financial and administrative backing, time and data required in its solution ?

9. Am I equipped with the general and specialized skills required in solving the problem ?

10. Will I learn something new from the study of this problem ?

11. Will my proposed data-gathering instruments actually give the information I want ?

12. Is the study, including the application of its results practical ?

13. Does the problem meet the personal purposes for which I have decided to undertake research ?

FORMULATING AND STATING THE PROBLEM

After the problem has been selected, it must be definitely formulated and stated. If it is to serve as a guide in planning the study and interpreting its results, it is essential that the problem is stated in precise terms. The type of statement to be employed depends on the preference of the worker and the nature of the problem. Preferably it should be set as a question or in such form that the question to be answered is clearly indicated. There are two different ways of stating a problem ;

1. Posing question/questions
2. Making declarative statement/statements.

One may choose any of these ways remembering that the question form has an advantage in sharpening and focussing the issue, but the declarative form is perhaps more common, and both of the ways may be combined easily in an initial statement.

DEFINITION OF THE PROBLEM

It implies the separation of the problem from the complex of difficulties and needs, It means to put a fence around it, to separate it by careful distinctions from like questions found in related situations of need.

To define a problem means to specify it in detail and with precision. Each question and subordinate question to be answered is to be specified. Sometimes it is necessary to formulate the point of view or educational theory on which the investigation is to be based. If certain assumptions are made, they are explicitly noted.

It is important to define and elucidate the problem as a whole and further define all the technical and unusual terms employed in the statement. By this the research worker removes the chance of misinterpretation of any of these crucial terms. The definition helps to establish the frame of reference with which the researcher approaches the problem.

In every area of research we have to proceed after making certain initial assumptions. For example, in educational research, the generally accepted assumptions are that school and education are necessary, a normal man is educable, there are differences among individuals and respect for individual is desirable as a way of life and education. Such other assumptions are stated as a part of the definition and development of the problem, and also in connection with the conclusions of the investigation.

The nature of study will also have to be explained, such as why it is a simple study, a critical study, an analytical study, an experimental study or a comparative study and what these terms stand for ?

The basic importance of the problem and its definition indicates that they should appear early in a report of educational research.

DELIMITATION OF THE PROBLEM

Here the investigator states the restrictions and limitations which he imposes on his study. It is a statement of the limits or scope of the investigation. This statement will provide information concerning who, what, where and how many. It will determine the boundaries of the project in hand.

This delimitation will mention the geographical limits of the study—*i.e.* whether the study will be covering a single town, a district, a region, a state or a country. It will specify the time limits of the study—*i.e.* whether the study will be spread over a few days, a few months, a year or a number of years. It will have to specify the type of institutions to be covered—*i.e.* the rural schools, the middle schools, the high schools, public schools, boys schools, girls schools, or co-educational schools. The type of subjects of the study will also be mentioned—*i.e.* the heads of the institutions, the science teachers, the parents, the adolescents or the sportsmen. Again it will be important to mention as to how many subjects will constitute the sample of the study and how they will be distributed over the institutions, geographical areas or time intervals. The age level, grade level, ability level, achievement level etc. will also have to be specified.

A recognition of the limitations of the study helps to focus attention on pertinent objectives and helps to minimise the danger of over-simplification.

A time schedule should be prepared so that the researcher may budget his time and energy effectively. Dividing the project into parts and assigning dates for the completion of each part helps to systematise the project.

JUSTIFICATION OF THE PROBLEM

It will be important to state in the very beginning how the results of the research will influence educational theory or practice. The urgency and worthwhileness of the project have to be justified. It will convince the readers about the significance of the investigation. This step would prevent a wastage of research effort on unimportant, trivial, superficial or insignificant problems. The problem should be broad-based enough to provide an investigation of real significance. The research worker would assess to what extent the solution of the problem would contribute for the furtherance of human knowledge. He has to indicate the chief purpose of the study at the outset and other subsidiary specific objectives that have compelled him to undertake such an investigation. The list of the objectives of the study magnifies further its utility and importance.

COMMON ERRORS IN SELECTING AND FORMULATING A RESEARCH PROBLEM

There are a number of errors which are committed by an average research worker while selecting and formulating a research problem. These errors need to be carefully avoided. These are enlisted below :

1. *Naming a broad field or area of study instead of a specific problem.* For example an investigator may undertake to study 'The Higher Secondary System in India,' or 'The Implementation of Kothari Commission Report.' These are too vast areas to be studied with full justice.

2. *Stating it such that investigation is impossible.* For example someone may state his problem as "The effects of working mothers on the academic achievement of their offsprings" or "The desirability of introducing typing in the elementary school."

3. *Narrowing or localizing a topic.* The problem may be narrowed to such an extent that it becomes too small and insignificant from research point of view. For example someone may choose to study "The history of a village school" or undertake "A critical study of the poems included in a Text Book."

4. *Including in it terms of an unscientific, emotional or biased nature.* For example someone may like to work on "Teaching as a great adventure" or "The blessings of teaching profession". This bias or pejudice is a constant error.

5. *Lack of precision in the instruments.* The tools, tests or devices which are proposed to be used in data collection may not be precise enough resulting in another constant error.

FIVE

The Hypothesis

The derivation of a suitable hypothesis goes hand in hand with the selection of a research problem. When the mind has before it a number of observed facts about some phenomenon, there is a need to form some generalization relative to the phenomenon concerned.

THE MEANING OF HYPOTHESIS

A hypothesis is a statement temporarily accepted as true in the light of what is, at the time, known about a phenomenon, and it is employed as a basis for action in the search for new truth.

A hypothesis is a tentative assumption drawn from knowledge and theory which is used as a guide in the investigation of other facts and theories that are yet unknown.

It is a guess, supposition or tentative inference as to the existence of some fact, condition or relationship relative to some phenomenon which serves to explain such facts as already are known to exist in a given area of research and to guide the search for new truth.

A hypothesis states what we are looking for. A hypothesis looks forward. It is a proposition which can be put to a test to determine its validity. It may prove to be correct or incorrect.

It is a tentative supposition or provisional guess which seems to explain the situation under observation.

A hypothesis is a tentative generalization the validity of which remains to be seen. In its most elementary stage the hypothesis may be any hunch, guess, imaginative idea which becomes the basis for further investigation.

Science employs hypotheses in guiding the thinking process. When our experience tells us that a given phenomenon follows regularly upon the appearance of certain other phenomena, we conclude that the former is connected with the latter by some sort of relationship and we form an hypothesis concerning this relationship.

Hypotheses reflect the research worker's guess as to the probable outcome of the experiments.

A hypothesis is an assumption or proposition whose tenability is to be tested on the basis of the compatibility of its implications with empirical evidence and with previous knowledge.

A hypothesis is therefore a shrewed and intelligent guess, a supposition, inference, hunch, provisional statement or tentative generalisation as to the existence of some fact, condition or relationship relative to some phenomenon which serves to explain already known facts in a given area of research and to guide the search for new truth on the basis of empirical evidence. The hypothesis is put to test for its tenability and for determining its validity.

IMPORTANCE OF HYPOTHESIS

Hypothesis has a very important place in research although it occupies a very small space in the body of a thesis. It is almost impossible for a research worker not to have one or more hypotheses before proceeding with his work. If he is not capable of formulating a hypothesis about his problem, he may not be ready to undertake its investigation. The aimless collection of data is not likely to lead him anywhere. The importance of hypothesis can be more specifically stated as under :

1. It provides direction to research. It defines what is relevant and what is irrelevant. Thus it prevents the review of irrelevant literature and the collection of useless or excess data. It not only prevents wastage in the collection of data, but also ensures the collection of the data necessary to answer the question posed in the statement of the problem.

2. It sensitizes the investigator to certain aspects of the situation which are relevant from the standpoint of the problem at hand. It spells the difference between precision and haphazardness, between fruitful and fruitless research.

3. It is a guide to the thinking process and the process of discovery. It is the investigator's eye—a sort of guiding light in the world of darkness.

4. It focusses research. Without it research would be like a random and aimless wandering.

5. It prevents blind research. Prevents indiscriminate gathering of data which may later turn out to be irrelevant.

6. It sensitizes the individual to facts and conditions that might otherwise be overlooked.

7. It places clear and specific goals before us. These clear and specific goals provide the investigator with a basis for selecting samples and research procedures to meet these goals.

8. It serves the function of linking together related facts and information and organising them into one comprehensible whole.

9. It enables the investigator to understand with greater clarity his problem and its ramifications, as well as the data which bear on it. It further enables a researcher to clarify the procedures and methods to be used in solving his problem and to rule out methods which are incapable of providing the necessary data.

10. It serves as a framework for drawing conclusions. It makes possible the interpretation of data in the light of tentative proposition or provisional guess. It provides the outline for stating conclusions in a meaningful way.

SOURCES OF HYPOTHESIS

The task of deriving adequate hypotheses is essentially parallel to that of selecting suitable problems. There is no royal road to the location of a suitable problem, likewise there is no royal road to the discovery of fruitful hypotheses. The derivation of a good hypothesis demands characteristics of experience and creativity. Though hypotheses should precede the gathering of data, a good hypothesis can come only from experience. Some degree of data gathering, the review of related literature, or a pilot study must precede the development and gradual refinement of the hypothesis.

The factor of persistence is no less important. Success in an investigation depends on the considerable time and effort spent in tracing and stating tentative hypotheses.

A good investigator must have not only an alert mind capable of deriving relevant hypotheses, but also a critical mind capable of rejecting faulty hypotheses. The person who is full of ideas may be lacking in critical analysis—that is, originality may be somewhat incompatible with a critical attitude.

The specific sources of hypothesis are being discussed below :

1. **General Culture**. In the investigations for solving problems of Indian Education our hypotheses cannot lose sight of the broad general culture to which we belong. While formulating such hypotheses we cannot ignore religious or moral bias in Indian Education, typical role of family in Indian Education, play interests of Indian children, our prejudices against women education, compulsory education or co-education. Our cultural heritage is a great source of ideas, theories, tentative theories and provisional propositions.

2. **Scientific Theory**. There are various scientific laws or theories

which are transferrable to the field of educational researches. For example, we have theories like—sound mind in a sound body, handicapped children face adjustment problems, rest relieves fatigue, etc.

3. **Personal Experience**. We have emphasized above that a good hypothesis can come only from experience. Some of our experiences may be directly changed into research hypotheses, for example—Teachers' character and personality are imbibed by the students, good study habits improve achievement, teacher's punctuality enhances student's punctuality, library reading enhances interest in knowledge, etc.

4. **Analogies**. Although reasoning by analogy generally is considered unacceptable as a source of proof, it is a very fertile source of hypotheses. It is the process of framing hypothesis from the likenesses and similarities. It is assumed that the existence of similarities between two situations is not accidental, but that it is the result of the operation of some law common to the two situations. For example if our problem is similar in nature to a problem studied in a foreign land, we may frame our hypothesis in the same manner.

CHARACTERISTICS OF HYPOTHESIS

To serve its intended purposes and to be upto the mark in view of its great importance the hypothesis must possess a number of characteristics, which are :

1. *A good hypothesis is in agreement with the observed facts.* A single unexplained conflict between fact and hypothesis is disastrous to the latter. A hypothesis is entirely plausible and conceivable. It is based directly on existing data. The investigator should not omit the evidence contrary to his own opinion, should not build his argument from positive instances and neglect the negative cases, should not argue from a limited number of instances and should not make supposition from insufficient data.

2. *A good hypothesis does not conflict with any law of nature which is known to be true.* The idea involved in this principle is not very different from that expressed in the preceding principle. We know that there are a number of conflicting theories of learning and teaching. These conflicts arise partly out of the failure of research workers to produce hypotheses that are in agreement with fact, and are not in conflict with any law of nature. When we say that there can be a memory tablet for strengthening memory, we are trying to disprove well established laws of nature.

3. *A good hypothesis is expert.* It is stated in a scientific and research like language and is not an ordinary statement.

4. *A good hypothesis is stated in the simplest possible terms.* It is also called the principle of economy. Ultimate generalisation of a

science should be reduced to the simplest possible form. It is not a literary statement. The number of hypotheses must also not be needlessly multiplied. The more insight the researcher has into the problem, the simpler will be his hypothesis about it.

5. *A good hypothesis permits the application of deductive reasoning.* It should be verifiable and testable. A hypothesis cannot be verified until deductions can be made from it which are capable of empirical verifications. It should be capable of being proved or refuted.

6. *It should be so designed that its test will provide an answer to the original problem which forms the primary purpose of the investigation.* It should be related to available knowledge or theory concerning the original problem area.

7. *It must be stated in final form early in the experiment before any attempt at verification is made.*

THE DISCOVERY OF HYPOTHESIS

One of the most important aspects of any investigation is that of securing sound ideas about the facts, conditions and relationships involved in the phenomenon. This process of securing sound ideas stands for the discovery of hypothesis which can be made more successful through following steps.

1. *The investigator should be well-read and well-informed about the problem.* The expert educational investigator, whether in the laboratory or in the field, is the one who is exceedingly well informed. Before a statement of hypothesis can be formalized in testable form, the researcher should review as much literature in the problem area and study as much related research as is practical under the circumstances.

2. *He should examine with care the commonplace features of objects.* We are so thoroughly habituated to our ordinary ways of thinking about things, that it is exceedingly difficult to see things in any other than the customary light. It is essential that those engaged in research be alert, not merely to the new and incidental features of objects, but to their more obvious features. They should free themselves from their bonds of conventional thinking and procedure and look with the greatest care at all of the ordinary and extraordinary aspects of the phenomena.

3. *He should see beyond the superficial aspects of objects.* The investigator should extend his vision to search for vital relationships beyond the superficial aspects of phenomena and to the underlying principles, conditions and uniformities. For example, objects which appear to be quite unlike may possess many similarities. He has to keep himself alert to the similarities of seemingly unlike situations.

4. *He should note the uniform connection of events.* The almost universal condition for the formulation of generalization is that one observe the simultaneous occurrence of conditions and events. Such

observations may be utilized in the formation of new hypotheses by enabling us to be more alert to the sequence of events.

5. *He should recognize the importance of analogy in the formation of hypothesis.* If two things resemble each other in one or more respects and a certain generalization is known to be true for one situation, it is considered to be true for the other. For the purpose of hypothesis, the points of resemblance must be weighed and not merely counted. The resemblances between objects may be of a superficial or non-essential nature. Science is concerned with essential likenesses and differences.

6. *He should recognize the importance of thinking about things.* We have discussed that one of the steps is to be well-read, and another is to come into first-hand contact with phenomena by systematically observing them or experimenting with them. A third step is to think about them.

THE USE OF HYPOTHESIS IN DIFFERENT TYPES OF RESEARCH

The use of hypothesis will vary somewhat with the type of research undertaken and the purposes to be served. In historical research the purpose may be either to produce a faithful record of the past or to extend the experiences with phenomena in the present to the past in order to make the view of the phenomena more complete. For the latter purpose, hypothetical thinking serves the conventional purposes of limiting the research, sensitizing the observer and colligating facts. When the purpose is only to produce a faithful record of the past, little or no use is made of hypothetical thinking except in establishing the record itself.

In normative-survey research the investigator may or may not employ the hypothetical type of thinking, depending upon his purpose. If he desires merely to know the status of certain phenomena, little or no use may be made of hypothesis. If however the investigator is working with some problem for which the solution depends upon study of the status of various diversified phenomena and their relationships, *e.g.* sex differences in the achievement of high school pupils, hypothetical thinking may play an important role. However, hypothesis does not appear to assume the significant role in normative-survey research that it does in either experimental or complex causal research. In these types of research, hypothetical thinking is best developed and plays an important part. Experiment is not the main source of scientific principles. It is the means of testing a deduction. Again, measurement is not the source of laws, it permits only the expression of a previously conceived law in mathematical terms.

DIFFERENT FORMS OF HYPOTHESIS

The hypothesis can be stated in a number of forms which are—

1. **Null form.** It states that no significant difference exists between

the variables concerned. For example—There is no significant difference in the instructional standards of single shift and double shift schools. The null form is preferred by most of the experienced research personnel. This form of statement more readily defines the mathematical model to be utilized in the statistical test of the hypothesis. The no-difference statement assumes that the two groups will be tested and found to be equal.

2. **Prediction form.** It is chosen because it allows the research worker to state principles which he actually expects to emerge from the experiment. This type of hypothesis is more useful in action research studies.

3. **Declarative form.** It generally states a relationship between the variables concerned. For example we can state that—there will be a significant difference in the instructional standards of boys and girls schools.

4. **Question form.** The above mentioned hypothesis in question form may read—"Is there a significant difference in the instructional standards of boys and girls schools ?"

DIFFICULTIES IN THE FORMULATION OF HYPOTHESIS

There are a number of difficulties from which a beginner may suffer at the stage of formulating a good hypothesis :

1. Lack of knowledge and clarity of the theoretical frame work of the area in which the investigator chooses to work.

2. Lack of ability to make use of the theoretical framework logically.

3. Lack of acquaintance with available research technique resulting in failure to be able to phrase the hypothesis properly.

4. Vagueness of the statement. For example —A course in ethics will make a student a more ethical adult.

TESTING THE HYPOTHESIS

The proof of the worth of a hypothesis lies in its ability to meet the test of its validity. After formulating a hypothesis, it is necessary to (*i*) deduce its consequences, (*ii*) select or develop tools that will determine whether these consequences actually occur, and (*iii*) use the tools thereby collecting facts that will either confirm or disconfirm the hypothesis.

There are two fairly important means of testing hypothesis : (1) the study of hypothesis for logical consistency ; and (2) the study of hypothesis for agreement with fact.

The study of hypothesis for logical consistency is a phase of thinking. It consists of checking the logical character of the reasoning by which the consequences of hypotheses are deduced for verification. In the second place, the study of hypothesis for logical consistency involves checking it for agreement with the already known laws of nature. It must not conflict with the highest and simplest laws of good thinking and it must not disagree with those principles of science which are considered valid beyond reasonable doubt. The suggested inferences are tested in thought, for logical coherence, before they are tested in action.

In the study of hypothesis for agreement with fact, one argues that if the hypothesis is true, certain facts, conditions or relationships will be found, then one looks to see if these conditions are present. After testing the hypothesis by applying it to already known facts, it may have to be tested by a new appeal to experience. In this new appeal the data are collected, recorded and manipulated according to the conventions of science. If the data already available are adequate, no new appeal to experience will be necessary.

A hypothesis is never proved, it is merely sustained or rejected. If it fails to meet the test of its validity, it must be modified or rejected. A hypothesis can be useful even if it is partly incorrect. The negative instances which occur require only further clarification and refinement of the hypothesis rather than its outright rejection.

The confirmation of a hypothesis is always tentative and relative subject to later revision and even rejection as further evidence appears or as more adequate hypotheses are introduced. Hypothesis is more tentative and less fully developed than theory, is more subject to modification and to rejection. A hypothesis is only theory in the making. When a hypothesis is sustained by logical and empirical tests, it provides the basis for generalizations or conclusions. As further confirmation and clarification of the conditions under which the hypothesis holds, accumulate, a generalization may become a law or principle. Sound theories are reached only after many hypotheses have been tried out and discarded or modified to harmonize with established facts.

SIX

Survey of Related Studies

The survey of related studies implies locating, studying and evaluating reports of relevant researches, study of published articles, going through related portions of Encyclopaedias and research abstracts, study of pertinent pages out of comprehensive books on the subject and going through related manuscripts if any. For any worthwhile study in any field of knowledge the research worker needs an adequate familiarity with the work which has already been done in the area of his choice. He needs to acquire up-to-date information about what has been thought and done in the particular area. He has to build upon the accumulated and recorded knowledge of the past. He draws maximum benefit from the previous investigations, utilises the previous findings, takes many hints from the designs and procedures of previous researches, matches his conclusions with the conclusions drawn earlier and tries to add from his side a line or two to the existing store of knowledge.

Purposes of Survey of Related Studies

The preliminary survey of previous studies, literature, discussions and experience related to the problem under investigation may accomplish a number of purposes. The search for related material is a time-consuming but fruitful phase of any research programme. Its specific purposes are :

1. It helps the research worker to find what is already known, what others have attempted to find out, what methods of attack have been promising or disappointing and what problems remain to be solved. It shows whether the evidence already available solves the problem adequately without further investigation.

2. It is the basis of most of the research projects in various sciences, and humanities. It forms the foundation upon which all future work will be built.

3. It enables him to know the means of getting to the frontier in the field of his research. Unless he has learnt what others have done and what still remains to be done, he cannot develop a research project that will contribute something to the knowledge existing in his field.

4. It furnishes him with indispensable suggestions about comparative data, good procedures, likely methods and tried techniques.

5. Through it he will also know in detail about all related research projects in progress but not yet completed or reported.

6. The insight into the methods, measures etc. employed by others will lead to significant improvement of his research design.

7. It makes him alert to research possibilities that have been overlooked and research approaches that have proved to be sterile.

8. It provides ideas, theories, explanations, hypotheses or methods of research, valuable in formulating and studying the problem.

9. It helps in locating comparative data useful in the interpretation of results.

10. Above all, it contributes to the general scholarship of the investigator.

11. It forms one of the early chapters of a research report for orienting the readers.

12. It prevents pointless repetition of research.

Avoidance of Duplication. When the investigator has selected and formulated his problem for study he has to conduct a thorough survey of the materials already available in the given field. Even while selecting and finalising the problem it is likely that he has made at least a partial survey. In order to determine whether his chosen problem has been partly or completely investigated before, he has to carry out a painstaking analysis of the available educational literature. If this preliminary step is neglected, he may be attacking a problem which has been satisfactorily worked out.

Avoidance of duplication has been especially stressed by Alexander by saying that the degree cannot be granted if the thesis overlaps to a large extent any previously published work. Unfortunately there are some instances where the candidate has not been intellectually honest and has appropriated large portions of the work of another without acknowledging his indebtedness. The duplication and wastage of effort may also be caused by ignorance where a research worker is half way with his own investigation and a dissertation on the same subject by some one else appears.

There are on record a few instances in which the problem was so vast and urgent that two or more scholars at distant places started working on it independently and almost simultaneously and concluded their investigations almost at the same time. It was difficult to decide as to which one of them should be given more credit than others in respect of originality and pioneership. Again it was difficult to decide whether or not some duplication or intellectual misappropriation had taken place.

In some cases the problem happened to be very wide and the area to be covered very vast, two or more workers were permitted to work jointly and submit a joint report. A better measure of the merit, initiative and performance of each worker can be obtained by breaking up the study into distinctly separate parts, if possible. The co-workers may first work in their own allotted domains and collaborate at the stage of merging their independent works to produce a joint report.

In the past, ignorance of related investigations was excusable to some extent because most of the bibliographical and library resources did not exist then. But today there is no reasonable excuse for this ignorance. If the present day research worker leaves his chapter on related information completely blank and makes a claim that his was a new investigation never carried out by anybody before, or that there was no previous study in the area of his choice, then he is almost certainly wrong. One should not conclude too early that related information on his topic does not exist, rather one should persist in one's search for the same.

At the same time, if it is assumed that the research worker has complete analytical knowledge of the studies reported in the field of his problem at the very beginning of his work before even evaluating and defining his problem, this would be expecting too much from him. Another possible misconception should be refuted here. The new research worker naturally wants to do something as distinctive and worthwhile as possible, something new. It may be safely said that much knowledge does not hamper originality. If the research worker is intelligent, information about the activities of previous investigators will stimulate him to use each bit of knowledge as a starting point for new and further progress. Buds of thought will burst out along the stem of reflection. Fine insights and hunches will appear. The research will be on a higher level of generalizations, and more complete. It will be a further original contribution to the sum of knowledge in the area concerned. The keys to the vast storehouse of published literature may open doors to sources of significant problems, good hypotheses, helpful orientation, scientific procedure and comparative data for interpretation of results. In order to be truly creative and original, one must read extensively and critically as a stimulus to thinking.

RESEARCH READING

Knowledge of the related investigations is gained most often through critical reading. Through every process *i.e.* locating and selecting the problem, analyzing the possible procedure, collecting evidence on any hypothesis, arriving at interpretations and conclusions, the matter of adequate reading ability is of supreme importance.

The art of research reading includes all the same skills that are involved in the art of discovery: keenness of observation, readily available memory, range of imagination, and of course, a reason trained in analysis and reflection.

SOURCES OF INFORMATION

There are various types of sources which have to be located and studied.

Primary Sources. These sources provide direct description of the study by the person who has actually observed or witnessed the occurrence and carried it out.

Secondary Sources. These materials include publications written by authors who were not direct observers or participants in the events described.

For example the portion of a book that describes the results of experiments that the author himself has carried out, may be treated as a primary source and the other portion of the book that describes the results of experiments conducted by others may be taken as a secondary source.

It is but evident that primary sources have to be preferred over secondary sources.

The sources of information have also been classified as direct and indirect sources.

Direct Sources. In the field of education, the direct sources of information are available in the form of educational literature of the following types :

1. Educational Journals.
2. Books, monographs, year books and bulletins.
3. Dissertations and theses.
4. Govt. publications, etc.

Indirect Sources. The indirect sources are available in the form of :

1. Encyclopaedias of Education.
2. Education Indexes.
3. Education Abstracts.
4. Directories and Bibliographies.
5. Bibliographical references.
6. Quotation sources.
7. Miscellaneous Sources.

THE SEARCH OF SOURCES

The search of sources will require systematic reading in the major field of one's interest and specialization. The library knowledge and skill needed by professionally alert research workers are listed by Alexander under eighty-three headings, from which five are quoted here to indicate the value of the entire list and its constituents. Such a check-list may be used by the research worker as a self-survey of his knowledge and deficiency.

1. Where can I find the significant facts about a community or an institution in which I would like to work ?

2. Do I know when and how to skim in library reading ?

3. Is there in existence a guide to the professional literature of my field ? If so, where is it and how may I secure a copy ? If there is no such guide, what ought to go into one so that I may keep my eyes open and in the course of several years gradually build one up for myself.

4. Which encyclopaedia is best for use in my major field ?

5. Which are the most useful three reference books for my major field ?

The same writer outlines in some detail the necessity for planning intelligently the search for library materials, mastery of the various types of reading skills needed, use of appropriate headings for the search, and knowledge of sound principles of note taking ; and reproduces an unusually complete form of bibliography card.

USE OF LIBRARY

The research worker should become thoroughly acquainted with the suitable library/libraries accessible to him, the location of their varied facilities and the regulations governing the use and circulation of materials. Effective research presupposes a good grasp of the organisation of the library and its content. The library is the storehouse of the knowledge and wisdom of endless quantity, variety and complexity. It is essential that the research worker knows how to locate and to use what is available. Without such a skill, he is simply a hunter lost in the forest.

Proficiency in the use of library or in the review of the literature consists of—

(*i*) the ability to locate sources directly.
(*ii*) the ability to browse through multiple sources quickly.
(*iii*) the ability to cull relevant material.
(*iv*) the ability to organize what has been accumulated ; and
(*v*) the ability to interpret it.

Many libraries have a printed guide that contains helpful information. A diagram may indicate the location of the stacks, the periodicals room, the reference division, reading rooms, and special collection of books, microfilm equipment, clippings, manuscripts or pamphlets. Another useful part of the guide may list the periodicals to which the library subscribes and the names of special indexes, abstracts and other references available. A third section may deal with the regulations concerning the use of the stacks, the use of reserve books, and the procedure for securing materials held by the library or those that may be procured from another library.

It is well to use the skill and knowledge of librarians, who are anxious to help the scholar find reference materials. But the researcher should not depend too much on the librarian and should learn to find his own references. He should acquaint himself with the system of book classification prevalent in his library/libraries, the location of the catalogue cabinets, the manner of consulting the catalogues, and then the respective shelves. Without losing much time, he should be able to go straight to the location where the material desired by him is likely to be lying.

Sometimes a scholar learns of a reference which is not available in the local library. Many libraries subscribe to a 'union' catalogue, which lists references found in other libraries. There are a number of ways in which these materials may be obtained by a library : by inter-library loan, by requesting a photostat copy, by requesting a microfilm, or by an abstracting or translating service.

In connection with any of the above services, the user is expected to bear the costs involved in reproducing, handling, and shipping the materials.

NOTE-TAKING

Purposeful and research reading demands a systematic and simultaneous note-taking. A careful note taking enables us to assimilate and retain much of what has been read or consulted as a reference material. We are used to taking notes from speeches, lectures, classroom discussions, conversation and reference materials. For research purposes, note-taking during the survey of related literature has to be orderly, systematic and scientific.

These reference notes may be classified under four main categories :

1. **Quotation**. The reader reproduces the exact words of the author and copies the material accurately. Exact page reference is also indicated so that the quotation may be properly footnoted in the written report.

2. **Paraphrase**. The reader restates and notes the author's ideas in his own words.

3. **Summary**. The reader records the contents of the material read by him in a condensed form. It is the shortened gist of the vast material found by him.

4. **Evaluation**. The reader interprets the point of view of the author, records his own impressions and reactions and indicates his agreement or disagreement with the author.

Criteria for good note-taking

It is highly disappointing when a note which has been taken after a great search and study is found to be not clear enough. At a later stage the researcher fails to remember as to why it was collected, where it came from, or what it is supposed to mean. Therefore it is essential that all these points are kept in view at the proper time while recording valuable information or taking important notes. The criteria to be observed for ensuring good note-taking are as under :

1. Convenience or ease of handling.
2. Flexibility.
3. Uniformity.
4. Accuracy of the data.
5. Ease of assembling.

In order to further ensure the quality, dependability and utility of these notes, the following points will be quite helpful :

1. Have a bird's eye view of the reference source before making a decision on the material for record and use.

2. Cultivate the art of selecting the most significant material.

3. Use 10 cms. × 15 cms. index cards.

4. Include only one topic/item on a card.

5. File each note-card under a definite topic or heading.

6. Place the subject heading at the top of the card for convenient filing.

7. Give a complete bibliographic citation at the bottom of the note-card.

8. Take notes in a complete and clearly understandable form.

9. Make a clear distinction between a summary, a direct quotation of the author, a reference to the author's source, and an evaluative statement.

10. On the very first occasion copy the notes correctly. Do not plan to recopy them or prepare a fair copy of the notes.

11. Keep the notes carefully filed lest they get lost or misplaced. A permanent file enables one to make use of notes in a number of ways.

Some Do's in the Survey of Related Literature

1. While surveying related literature keep constantly in mind the objectives of your research.

2. Prepare a bibliographical card for each book or article that you believe might contain material pertinent to your investigation.

3. Accuracy is extremely important in preparing bibliographical cards.

4. Spend some time to determine the most efficient way of obtaining the necessary references.

5. Consult other libraries also. If necessary, obtain microfilm or photostatic copies of any reference not locally available.

6. Start your survey by going through the most recent of the important studies.

7. First turn to the summary of the journal or the article.

8. In taking notes, be as brief as possible.

9. Record your evaluation of the material and note how it relates to your research.

10 Copy only those quotations that are stated very skilfully or in very concise terms.

Some Dont's in the Survey of Related Literature

1. Do not dispose of the work of survey in a hurry.

2. Do not rely too heavily upon secondary sources.

3. Do not concentrate only on research findings and do not overlook information on methods, tools and so on.

4. Do not overlook sources other than educational journals such as newspapers and literary magazines which often contain articles on educational topics.

5. Do not fail to define satisfactorily the topicwise limits of the survey of related studies.

6. Do not copy bibliographic data incorrectly.

7. Do not copy too much material on note-cards.

THE BIBLIOGRAPHY

As the investigator goes through the related literature, the bibliography begins to take shape. With the development of a specific centre of interest and the location of the problem, work on the bibliography becomes more analytical and selective. With the progress in the survey of related literature, the bibliography becomes more pertinent, selected and annotated. The final purpose is to have it in proper form as an appendix in the final typed or published report. It will also become the basis for the content of the chapter or section on previous research in the final report.

Every item in this list should be justified in terms of its close relationship to the investigation. Just any title will not do. It must be pertinent. If it is a book, it may be that one chapter is referred to, a knowledge of the content of which is indispensable. If it is a magazine article, its subject matter should be pertinent to the objectives of the study in hand. The word selected suggests that the annotated bibliography should be relatively short, as well as strictly to the point. In addition to publications specifically pertinent to the study being made, many research students wish to include a number of more general references that will furnish a measure of their complete grasp of the important literature of the field.

The reason for including the annotated bibliography in the final report is threefold. In the first place, just to be respectable scientifically the research worker should report a well-organized bibliography in the correct form and properly annotated. It is an index of the control the research worker has of the entire field of literature pertinent to his study. But most important of all is the fact that the scientific reporter is duty bound to help in establishing a continuity of study and investigation in the research area in which he is working. A highly useful and uptodate material is handed over to the next student if the final bibliography is inclusive and well annotated.

GUIDES TO EDUCATIONAL LITERATURE

The research worker in the field of education needs to acquaint himself with the specific publications and other items to which he may turn for collecting relevant information. There are certain productions and collections which are exclusively prepared for the benefit and convenience of the research scholar. Certain sources offer him almost the entire related literature in a consolidated form at one place. These sources further guide him about the titles and identifications of the original productions if he needs to go in for a more thorough study of any one of them. Some of the most important guides to Educational literature are being discussed below :

1. Encyclopaedias of Education

Encyclopaedias are generally very huge or multi-volume publications. They contain articles of bibliographical and general character both. They are the work of a group of experts in the various areas of education. Organisation of their contents is usually alphabetic, but sometimes dual also—(*i*) general topic-wise arrangement in an alphabetic sequence, and (*ii*) bibliographical arrangement in another alphabetic sequence. They carry a complete and fully detailed index making extensive cross-references. The spirit of the material of a good encyclopaedia is always scholarly. It gives a complete and balanced selection of topics accurately representing education at all stages and in its various aspects.

Among the encyclopaedias of education, Walter S. Monroe's *Encyclopaedia of Educational Research* occupies a place of pride. It was issued by the American Educational Research Association in 1941. Its old addition contains nearly 250 research articles by eminent authors on practically every aspect of education with over 12,200 bibliographical references to significant research studies. Its new edition has a much wider coverage including reports of educational research not only in America, but in other countries as well.

Another American encyclopaedia that needs to be mentioned here is the *Encyclopaedia of Modern Education*, prepared by Henry D. Rivlin and H. Schueller, published in New York in the year 1943 by the Philosophical library. It is the work of over 200 eminent contributors and covers the entire field of education.

2. Education Index

Index as a guide to literature serves the same purpose as the index of a book or the card file of a library. It gives the list of titles, publications, manuscripts or reports. Its arrangement is alphabetical under subject and author headings. It identifies also the subject of the book or article. Most of the indexes provide complete direction for locating the books, publications or articles.

Indexes may be general or specialized. One of the specialised indexes is the *Education Index*, New York ; H.W. Wilson Co., published from 1929 onwards. It is issued monthly (September through June) annually and every three years. It is the most valuable single source or guide to periodic literature in education, having served as a comprehensive index of practically all the publications in the discipline. It enlists :

(*i*) All books on professional education.

(*ii*) Year books and other publications of professional societies and associations.

(*iii*) Publications of the U.S. Office of Education.

(*iv*) Publications of N.E.A. and its branches.

(*v*) Bulletins, monographs and reports on education.

(*vi*) Articles published in about 175 educational periodicals.

(*vii*) Articles on education published in non-professional publications.

(*viii*) Book reviews and book lists.

(*ix*) Bibliographies published.

(*x*) Courses of study published.

(*xi*) Tools of research and evaluation.

(*xii*) Reference books.

(*xiii*) Names of professional associations and bodies.

(*xiv*) Meeting dates of professional organisations.

References are not carried over from one three-year index to the next.

There are some other *Educational Indexes* also which are worth mentioning :

(*i*) *International Guide to Periodic Literature.* New York : M.W. Wilson Co., 1913—up-to-date.

(*ii*) *Cumulative Book Index to Periodic Literature*, New York : M.W. Wilson Co., 1928—upto date.

(*iii*) *Readers Guide to Periodic Literature*, New York : M.W. Wilson Co.. 1900—up-to-date.

(*iv*) *British Education Index.* Vol. I., August 1954 to Nov. 1958. Compiled by The Librarians of Institutes of Education.

(*v*) *Index to Selected British Educational Periodicals* (Leeds), Librarians of Institutions of Education. 1954 onwards.

(*vi*) *Subject Index to Periodicals*, London. The Library Association, 1919 onwards.

(*vii*) *Indian Education Index*—a monthly bulletin issued by the Central Secretariat Education Library. It indexes the articles of important Indian educational journals.

(*viii*) *Australian Education Index*, Australian Council for Educational Research, Hawthorn E.G., Victoria, Australia.

(*ix*) *Education Index*. H.W. Wilson, 950 University Ave; New York, U.S.A.

(*x*) *Foreign Education Digest*, 1650, Oxford Street, Berkeley 9, California, U S.A.

(*xi*) *Health Information Digest*, Central Council for Health Education, London, W.C.I.. England.

(*xii*) *Index and Abstracts of Foreign Physical Education Literature*, Indianapolis 18, Indiana, U.S.A.

3. Research Abstracts

The reference guides literature known as educational abstracts, psychological abstracts, education digests or educational reviews provide a systematized list of reference sources including brief summaries of each article. In many advanced countries, educationists have their special 'Educational Abstracts' to serve them. Some of the well known abstracts are enlisted below :

(*i*) *Educational Abstracts*. It is an American journal established in January 1936. It presents concise abstracts from books, journals and monographs in both American and foreign literature five times a year.

(*ii*) *Psychological Abstracts*. Washington, D.C., American Psychological Association 1927—to date. It is a monthly publication and contains abstracts of articles appearing in over five hundred journals in psychology and related areas. Its contents are divided area-wise into different sections.

(*iii*) *Education Digest*. Ann Arbor, Michigan, 1935—up-to-date, monthly, September to May. It publishes select articles, reduced to digest form, from various U.S. educational periodicals and reports. About 200 articles selected for their current educational interest in U.S. education are digested every year. An author index is included in each issue.

(*iv*) *Dissertation Abstracts*. Ann Arbor, Mich. University Microfilms, Inc. (1955 to-date). It is a monthly compilation of abstracts of doctoral dissertations submitted by over one hundred cooperating institutions. Abstracts give a good coverage of the essentials of dissertations.

(*v*) *Review of Educational Research*. Washington, American Educational Research Association (N.E.A.) 1931 onwards. Published five times in a year, it briefly summarizes research findings in education under eleven major areas—Administration, Curriculum, Educational Measurement, Educational Psychology, Guidance, Mental and Physical Development, Language, Arts, Research Methods, Special Programs, and Teacher Personnel.

(*vi*) *Education Abstracts*. Paris, UNESCO, 1940 onwards, monthly except in July and August. Each introductory essay is devoted to a particular aspect of education and it is followed by abstracts of books and documents selected from various countries.

(*vii*) *Foreign Education Digest*, Berkley, California, 1936 onwards. It is a quarterly divided into two parts. Part I contains about 35 digests, classified under distinct headings. Part II is an annotated bibliography of foreign education comprising about 75 items including a number of articles. Over half of the entries in both the parts are Journal entries. About 50 educational journals from 15 countries and about 25 reports are the subject of this digest.

(*viii*) *Indian Education Abstracts*. Since 1955, the Ministry of Education, Govt. of India, has been issuing this quarterly abstract. It confines itself to books and periodicals pertaining to Indian Education published either in English or Hindi. Over 50 Indian journals are indexed in the various issues. Subject headings under which the abstracts appear are varied. Each entry includes the usual bibliographical detalis and indicates the synopsis of the article, the purpose of the author and the conclusions he arrives at. Each issue comprises about 150 entries.

(*ix*) *Research Studies in Education*. Bloomington Ind. Phi. Delta Kappa, 1953 up-to-date. It is published each year and contains a subject index of dissertations completed and under way in education. It also provides valuable material on current problems and trends in education.

4. Bibliographies and Directories

There are a number of bibliographies and directories which are devoted to educational research and which serve as useful guides for educational workers. A few examples are given below :

(*i*) *A select bibliography of adult education in Great Britain* by Kelly, Thomas, ed. It includes works published upto 1950. It was published by National Institute of Adult Education in 1952. It is the complete bibliography of education in U.K. and includes even important unpublished theses bearing on the subject.

(*ii*) *Doctoral Dissertations accepted by American Universities*. It is published by the Association of Research Libraries every year since 1934.

(*iii*) *Researches in Educational Psychology*. It is the directory of dissertations in the subject presented for higher degrees in the Universities of the U.K. and the Irish Republic since 1918 onwards. It is compiled by National Foundation for Educational Research in England and Wales.

(*iv*) *Master's Theses in Education* by Lamke T.A., and Silvey, Herbert M. and published in 1951 by the Bureau of Research of Iowa State Teachers College.

(*v*) *Bibliography of Research Studies in Education*. It is published annually by U.S. Office of Education since 1928. It gives classified and annotated lists of completed researches reported to the Office of Education and includes doctoral dissertations, masters' theses and faculty studies. It also contains index of institutions, authors and subjects.

(*vi*) *Research Studies in Education*. It is subject-wise coverage of doctoral dissertations, reports and field studies. It is compiled by Lyda, Mary Louise and Brown, Stanley B. It was first published in 1953. It is a loose leaf file with annual supplements.

(*vii*) *Register of Educational Research in India*. It presented a bibliography of educational research undertaken in various parts of the country.

(*viii*) *Bibliography of Doctorate Theses in Science and Arts* accepted by the Indian Universities from 1946 onwards. It has been published by the Inter-University Board of Indian Universities. Theses are enlisted university-wise with subject subheadings including Education.

5. UNESCO Publications

UNESCO has brought out a number of *International Directories of Education* which are very useful as reference material. They are being introduced below :

(*i*) *Educational Publishers*. It facilitates exchange of information on publications by providing reference information on educational publishers to the librarians, educators and research workers. Part I enlists international and national publishers' associations and Part II deals with individual educational publishers and producers of teaching materials. It is trillingual publication being published simultaneously in English, French and Spanish.

(*ii*) *Educational Periodicals*. Part I covers periodicals brought out by international bodies and all the countries except U.S.A. Part II gives the educational periodicals appearing in the U.S.A. It enlists approximately 5000 current educational periodicals from more than 100 countries and territories. It is trillingual, being published simultaneously in English, French and Spanish.

(*iii*) *Teachers' Associations*. It is designed to facilitate and encourage co-operation between various associations of teachers and individual members of the teaching profession. It enlists names, addresses, membership details, functions and publications of teacher's associations in 127 countries. It is also a trillingual (English, French, Spanish) publication.

(*iv*) *International Guide to Educational Documentation*. It is an inventory of resources in educational documentation in 127 countries. Apart from bibliographical accuracy, adequate stress is placed on explanation and annotation. It enables the reader to select material answering his needs, to locate it and to obtain it.

(*v*) *International Yearbook of Education*. It presents reports from more than 100 countries and analyses educational trends all over the world.

(*vi*) *A Manual of Educational Statistics*. This mannal, based largely on information received from member states of UNESCO, offers suggestions concerning definition, classification and tabulation of educational statistics with a view to furthering international standardization.

(*vii*) *Study Abroad*. It contains information on approximately 1,30,000 individual opportunities for subsidized international study and travel.

(*viii*) *Unesco handbook of international exchange*. It provides information on the aims, programmes and activities of national and international organizations. It also enlists agreements concluded between states on international relations and exchanges in the fields of education, science, culture and mass communication. It is a quadrillingual (**English**, French, Spanish, Russian) publication.

(*ix*) *Unesco statisical yearbook*. It covers the subjects like population education, libraries, museums, non-periodical publications, newspapers,, periodicals, paper consumption, films, radio, television, etc.

(*x*) *World Survey of Education*. Unesco brings out three different volumes on the aspects of Educational organisation and statistics, primary education and secondary education. These volumes contain up to-date descriptions and statistics on the educational systems of almost two hundred countries and territories. The statistics cover the number of schools, pupils, teachers enrolment in higher education by faculties, public expenditure on education, problems, trends, etc.

(*xi*) *Expansion of school building*. It gives a comparative view of all the aspects of the question ; legislative, administrative, financial responsibility, assistance given by local communities, etc.

(*xii*) *Organization of special education for mentally deficient children*. It gives comparative and individual studies of more than seventy countries regarding methods of detecting mental deficiency in school children, the organization of special establishment to deal with the problem and special training for teaching staff.

(*xiii*) *Statistics on special education*. It carries statistics from more than fifty countries on general or vocational education given to children who are physically or mentally handicapped, socially maladjusted or in some other special category requiring special education. General comparative statistics are followed by figures showing the number of special schools, classes, teachers, pupils etc. in each country.

(*xiv*) *Educational Planning : Research in comparative education*. Owing to the increasing rapidity of social changes, the extra-ordinary advances in scientific discovery and to ever-growing needs all countries are being forced to find systematic means of balancing their resources one with another and in relation to the future. Relevant to educational planning, a bibliography and a directory of training and research institutions have also been published.

(*xv*) *Facilities for education in rural areas : a comparative study*. It is an analysis of efforts being made to bridge the gap between rural inhabitants and others with regard to educational opportunities.

6. Yearbooks of Education

Yearbooks contain data and articles on education which are prepared by eminent scholars and educationists. These are published once in a year. They are a very useful source of information for the students of education, educational administrators and research workers. The following yearbooks deserve a special mention :

(*i*) *International Yearbook of Education*. As earlier stated, it is a publication of the UNESCO. It presents reports from more than hundred countries and analyses trends in the various aspects of education.

(*ii*) *Yearbook of Education*. London : Lanwerys J.A. and others, eds. It is prepared under the joint editorial responsibility of the University of London, Institute of Education and the Teachers College, Columbia University. Each of its issues is reserved for one particular aspect of education which is discussed at length by eminent educationists in the field. Following topics have been discussed in various yearbooks. Status and position of teachers, Educational and Technological Development, Educational Counselling, Education and Economics, Education and Philosophy, The Secondary School Curriculum, Higher Education, Impact of Mass Media of Communication on Education, Concepts of Excellence in Education, Teacher Education, Education of the Gifted, Education and International Life, etc.

(*iii*) *Educational Yearbook of the International Institute of Teachers' College*. New York : Bureau of Publications, Columbia University. It is prepared by Kandel I.L., ed., and is one of the outstanding reference books for comparative education.

(*iv*) *Indian Yearbook of Education*. The first Indian Yearbook of Education was published by the National Council of Educational Research and Training, New Delhi in 1961. It was devoted to the review of education in India from 1947–61. The second yearbook appeared in 1964 and it was devoted to an examination of the problem of elementary education in India. Its publication has been continuing over the years.

(*v*) *Educational Statistics* (*India*). Educational statistics of the entire country are compiled and published by the Ministry of Education, Govt. of India in a series of three annual publications—Education in India, Education in the States and Education in the Universities in India. In addition, statistical data regarding education in the country are available in the annual reports on education, published by the respective state governments.

7. Dictionaries

There are quite a few very good dictionaries of education, psychology or sociology which are very useful in understanding, defining, interpreting and explaining various technical terms. Some of the popularly known dictionaries are :

(*i*) *Dictionary of Education* by Carter V. Good, Ed., New York : Mc Graw Hill Book Co.

(*ii*) *A Dictionary of Psychology* by H.C. Warren, Ed ; Boston : Houghton Mifflin Co.

(*iii*) *New Dictionary of Psychology* by Philip L. Harriman, New York : Philosophical Library.

(*iv*) *Dictionary of Sociology* by H.P. Fairchild, Ed. New York : Philosophical Library.

(*v*) *Comprehensive Dictionary of Psychological and Psychoanalytical Terms* by Horace B. English and Ava C. English, New York : Longmans Green and Co.

8. Reference Books

The investigator must find out the reference books relevant to his field of work. It is very rewarding both from the point of view of general scholarship and expertise, to go through these authoritative books. We can quote here the example of a book, *How to locate Educational Information and Data*, New York, Teachers College, Columbia University, which is a very valuable reference book. It familiarizes the student with many sources that are widely used and are often difficult to find. It provides information on institutional publications, publications of regional educational associations, educational directories, government documents, news items, etc.

9. Research Journals, Periodicals, etc.

Still the most up-to-date and the latest information about any field would not be available either from encyclopaedias or from other sources like books. The investigator will have to turn to the *research journals*, *periodicals*, etc. to up-date his acquaintance with the field concerned. There are innumerable research journals and periodicals which can be gone through by him with sufficient advantage. Only some most important out of them are enlisted below for the benefit of a would be scholar.

(*i*) *California Journal of Educational Research*. It is published five times in a year by the California Teachers Association for the California Advisory Council on Educational Research—693 Sutter St. San Francisco 2, California.

(*ii*) *Journal of Educational Research*. Published nine times in a year by Dembar Publications, 303 East Wilson St., Madison 3, Wisconsin.

(*iii*) *Journal of Educational Psychology* : Published eight times in a year by Warwick and York, 10 East Centre St., Baltimore 2, Maryland.

(*iv*) *Journal of Experimental Education*. Published four times a year by Dembar Publication, 303 East Wilson St., Madison 3, Wisconsin.

(*v*) *Educational and Psychological Measurement* : Published four times a year. Box 6907, College Station, Durham, North Carolina.

(*vi*) *Research Bulletin of the National Educational Association* : Published four times in a year by the National Education Association, Research Division, 1201 Sixteenth St., N.W. Washington, D.C.

(*vii*) *Review of Educational Research* : Washington, D.C., American

Educational Research Association, 1931 up-to-date. This is published five times in a year and each number covers an important educational topic and generally contains several articles dealing with different aspects of the topic covered. Each of these articles contains an exhaustive bibliography that a research worker can check for reference pertinent to his research problem.

(*viii*) *The elementary school journal*, Chicago : University of Chicago Press (1900 up-to-date). This is a monthly journal. Each issue contains some aspect of elementary education and also contains a list of new books, pamphlets, etc.

(*ix*) *The School Review*, Chicago : University of Chicago Press (1893 up-to-date). This is a quarterly journal and each issue contains a review of some educational topic besides listing new books, pamphlets, and annual reports on secondary education, and publications for high school teachers and students.

(*x*) *Australian Journal of Education.* C/o Librarian, University of Sydney, New South Wales, Australia.

(*xi*) *Australian Teacher*. Teacher's Guide of New South Wales, 44, Margaret Street, Sydney, Australia.

(*xii*) *Bulletin of International Bureau of Education*, International Bureau of Education, Palais Wilson, Geneva, Switzerland. It is a quarterly journal.

(*xiii*) *Education* (England) Association of Education Committees, Councils and Education Press, 10 Queen Anne St. London, W.I. England. It is a monthly journal.

(*xiv*) *Education in Japan*, Research Section, Research Bureau, Ministry of Education, Kashmigareki Chiyoda—Km, Tokyo, Japan.

(*xv*) *C.I.E. Newsletter*, Central Institute of Education, 33 Chhatra Marg, Delhi-6, India.

(*xvi*) *Education Quarterly*, Ministry of Education, Theatre Communication Building, Connaught Circus, New Delhi.

(*xvii*) *Education Quarterly* (Nepal), Bureau of Publications, Education Development Project, Kathmandu, Nepal.

(*xviii*) *Educational India*, Masulipatnam—South India.

(*xix*) *Educational Review*, Sankuwar Street, Triplicane, Madras Street.

(*xx*) *G.C.P.I. Newsletter* The Coordinator, Deptt. of Extension Services, Government Central Pedagogical Institute, Allahabad.

(*xxi*) *Educational Record*, Institute of Education, University of Birmingham, Birmingham, England.

(*xxii*) Hindi Shikshak (Hi,) Hindi Shikshak Karyalaya, 125, Girgon Road, Bombay-4.

(*xxiii*) *Ibadan Journal of Education*, University College, Ibadan, Nigeria.

(*xxiv*) *New Education*, Teachers College, Saidapet, Madras-15.

(*xxv*) *Progress of Education* 624, Sadashiv Peth, Poona-2.

(*xxvi*) *Journal of Education*, West Bengal College and University Teachers Association, 13, Mirzapur St. Calcutta-12.

(*xxvii*) *Journal of Education*, University of British Columbia, Vancouver B.C , Canada.

(*xxviii*) *Malayan Educator*, Malayan Teachers Union, 2, Mandalay Road, Penang, Malaya.

(*xxix*) *Mathematics Teacher*, Washington, U.S.A.

(*xxx*) *National Education*, Wellington, New Zealand.

(*xxxi*) *Teacher Education*, N.C.E.R.T, New Delhi.

(*xxxii*) *V.O.C. Journal of Education*, Teachers College, Tuticorin-3.

(*xxxiii*) *Vigyan Shikshak*, All India Science Teachers Association, 33, Probyn Road, Delhi.

(*xxxiv*) *WUS in Action*. World University Service, Geneva, Switzerland.

(*xxxv*) *Indian Journal of Adult Education*, 17-B, Indraprastha Marg, New Delhi.

(*xxxvi*) *British Journal of Educational Psychology*, Sheffield—10, England.

(*xxxvii*) *Education and Psychology Review*, M.S. University of Baroda, Baroda.

(*xxxviii*) *Higher Educational Journal*, London, W.C.I, England.

(*xxxix*) *International Association of Universities Bulletin*, Paris, France.

(*xL*) *Journal of University Education*, University of Delhi, Delhi-6.

(*xLi*) *Studies in Education*, University of Hull, England.

(*xLii*) *Studies in Education*, Trivandrum.

(*xLiii*) *University Times*, Patna-4.

(*xLiv*) *Journal of Physical Education and Recreation*, Kandivli, Bombay.

(*xLv*) *School and Society*, New York 23, U.S.A.

(*xLvi*) *Secondary Education*, Ministry of Education, New Delhi-2.

(*xLvii*) *Psychology Studies*, Mysore University, Mysore.

SEVEN

Classification of Research Methods

Methods of research may be classified from many points of view :

(*i*) the *fields* to which applied : education, philosophy, psychology, etc.

(*ii*) *purpose* : description, prediction, determination of status, determination of causes.

(*iii*) *place* where it is conducted : in the field or in the laboratory.

(*iv*) *application* : pure research or applied research.

(*v*) *data-gathering devices* employed : tests, rating scales, questionnaires etc.

(*vi*) *character of the data* collected : objective, subjective, quantitative, qualitative, etc.

(*vii*) *forms of thinking* : deductive, inductive, etc.

(*viii*) *control of factors* : controlled and uncontrolled experimentation.

Although the problem here described is primarily one of terminology, it is nevertheless exceedingly important, especially when one wishes to describe the procedures used in ones' own investigations or to give systematic instruction in the methodology of research.

William H. Kilpatrick distinguishes between three kinds of research : scientific, historic and philosophic.

Monroe and Engelhart give illustrations of subjective, analytical, experimental, historical, interview, legal questionnaire, survey, test-construction, and observation techniques.

Crawford's classification includes experimental, historical, psychological, case study, survey, curriculum making, job analysis, interview, questionnaire, observation, measurement, statistical, tabular and graphic, and library techniques.

Waples and Tyler discuss techniques of analysis, reading and recording, observation, personal interview and group conference, obtaining written statements by question blanks, checklist, sampling, classification, summarizing, evaluation, individual judgement, group rating, comparison, space and frequency counts, testing and experimentation.

Koos recognizes the questionnaire, experiment, measurement, documentary analysis, case, mathematics and survey.

A sociologist has analyzed the methods of sociological research applicable to a study of child-development under the headings of methods and teachniques.

Methods of Research :

1. The historical method
2. The survey method
3. The case method
4. The statistical method
5. The experimental method
6. Combination of the above.

Techniques of Collecting Data :

1. The questionnaire
2. The interview
3. Autobiographies
4. Moving pictures
5. Tests and rating scales
6. Observation
7. Documentary evidence
8. Combination of the above techniques.

No attempt should be made to characterize one method as more important than another, since the purpose to be served and the conditions to be met must determine the value of a research method in a given situation. Therefore the classification adopted in this book or the arrangement of investigational procedures is intended merely as a working classification of the various methods or techniques of collecting educational data, without any claim of finality.

Distinguishing Characteristics of the major research methods

The classification of methods may be presented to advantage in tabular form, with the source of data, type of control, approach, typical purposes for each research method, and typical forms of stating results as the sub-headings. The chief sources of data are direct and indirect observation, with the aid of various measuring instruments, data-gathering devices and documents. Observation may be under controlled conditions, as in experimental and laboratory studies or uncontrolled, as in historical or survey studies. The approach may be longitudinal as in historical and in most genetic and case study research, or cross sectional, as in normative-survey and experimental work. Some interesting comparisons may be noted in the various columns of the table.

Distinguishing Characteristics of the Major Research Methods

Method	Source of Data	Type of Control	Approach	Typical Purposes	Typical forms of stating results
1. Historical	Direct observation, as an eye-witness ; indirect observation through documents, remains and eye-witnesses.	Uncontrolled observation.	Longitudinal	Accurate record of past events. Status of phenomena at given times. Interpretation and evaluation of present day problems and procedures. Determination of causal relationships.	Verbal exposition and interpretation.
2. Normative Survey	Direct observation, as in the interview and measurement; indirect observation through questionnaires, check lists, etc.	Chiefly uncontrolled observation but controlled in the case of testing.	Cross-sectional	Status and comparison of objects and conditions at the present time. (In some cases causal relationships may be involved.)	Measures of central tendency and variability.

3. *Experimental*	*Direct observation and measurement.*	*Controlled observation.*	*Cross-sectional*	Determination of causal relationships, evaluation and comparison experimentally of educational procedures.	Amounts and reliabilities of experimentally produced changes.
4. Other Methods especially for studying complex causal relationships					
(*a*) Causal comparative	Direct observation and measurement	Uncontrolled observation.	Cross-sectional	Determination of causal relationships.	Group likenesses and differences.
(*b*) Correlation	Direct observation and measurement	Chiefly uncontrolled observation.	Cross-sectional	Determination of causal relationships and prediction.	Correlation coefficients and regression equations.
(*c*) Case study	Direct and indirect observation, measurement and documentary evidence.	Chiefly uncontrolled observation.	Longitudinal	Determination of causal relationships.	Individual case histories.

(*d*) Genetic	Direct observation and measurement.	Controlled and uncontrolled observation.	Longitudinal preferably but may be cross-sectional	Determination of change, growth and development. Discovery of characteristic traits and norms at different age levels. Determination of causal relationships.	Growth norms

EIGHT

Historical Method

Etymologically, historia originally meant learning or knowledge through enquiry. In other words, it signified knowledge gained by a process similar to research. History gives an exact knowledge of the past and enables one to interpret the future.

History is an integrated narrative of past events representing a critical search for the whole truth. Historical approach to the study of any subject denotes an effort to recount some aspect of past life.

In current usage, the term history is restricted to human history, for, the earth and the solar system have a past which we do not include in history. In academic terminology history refers largely to political history although the recent trend is to trace the political history of a country against the background of economic, social and cultural developments. Modern trends in history are to emphasize human life in its wider aspects and to relate political events to their contemporary milieu. It is the study of the development of human societies in space and time. This development is the result of billions of individual actions. But in so far as they are purely individual these actions do not belong to the domain of history. Historical actions are those which have influenced the collectivity. History is thus allied to sociology and psychology and at the same time it differs from them.

Man is peculiar in possessing a sense of history, apart from personal memory which he may share with the lower orders of living beings. Human beings do not merely have the gift of memory but also like to remember. Witness the craze for souvenirs, mementos, etc. The heritage of man is due to his high regard for the achievements of past generations and to this sense of history. It is also contended that history is utilitarian. Our present day problems can be better understood by a reference to the past. History even enables us to interpret the future.

History serves its greatest purpose as a record of the march of humanity on the road of progress. History is often called as the reconstruction of the past. This reconstruction is based on inferences made from documents. The term document is used here in a broader sense than it is used in daily living. A document is an impression left by a human being on a physical object. The impression may be made with ink on a piece of paper, with a sculptor's chisel on a piece of stone, with the artist's brush on canvas, with the potter's hand on soft clay, and in any other way in which a human may leave a trace of his activity. The focus of history may be directed towards an individual, a group, an idea, a movement or an institution. But no one of these objects of historical observation can be considered in isolation. These elements are always interrelated.

HISTORICAL RESEARCH

Historical research is the application of the scientific method of inquiry to historical problems. It demands standards of careful methodology and spirit comparable to those which characterize other types of research.

Historical research is one of the most difficult types of investigations to conduct adequately. Although everyone is a historian in that he remembers what occurred in the past, such history does not meet the critertia of historical research. If it is to be a science, it must achieve same standards of excellence as other forms of research. While historical research does not meet some of the tests of the scientific method, it does qualify from the standpoint of its subscription to the same principles and the same scholarship and accuracy which characterize all scientific research.

Historical research is viewed in three different ways : (*i*) *historical approach*, which refers to the organisation of historical facts in support of the new concepts to be developed, (*ii*) *historical subjects*, referring to biographies of great men, monographs of places, and sketches of ideas, thoughts and trends, and (*iii*) *historical technique*, which refers to research that is conducted on the bases of historical records and documents.

Historical method of research covers the following sub-divisions : (*i*) historical, (*ii*) legal, (*iii*) documentary, (*iv*) bibliographical, (*v*) biographical, (*v*) ideational, (*vii*) institutional and (*viii*) organisational.

Purposes and Values of Historical Research

The purposes for which historical research is undertaken are many and varied. We have to highlight these purposes and values with respect to historical research in the field of Education.

1. The foremost purpose is to gain a clearer perspective of the past and the present. The present problems are understandable only on the basis of their past.

2. It provides us with a greater appreciation of the culture and of the role which education is to play in the progress of society.

3. The most common motive is to arrive at an accurate account of the past.

4. This study provides important information concerning the effects of certain past educational practices and may suggest programmes for future action, based upon the evaluation of these past experiences.

5. It helps in avoiding mistakes of the past.

6. A comprehensive and realistic thinking in the processes like Education must depend upon the knowledge of the origins which influence their present position.

7. Serial approach makes it easier to recognise and identify significant factors in the existing complex situation.

8. It enables us to understand the dynamics of educational change.

9. It develops understanding of the deep-rooted causes of the present day educational problems.

10. It develops our ability to locate, analyse and appraise historical evidence and to understand the limitations of this evidence.

11. It helps remove educational prejudices, misconceptions, fads and frills.

12. It is a necessary foundation for any educational reform.

13. Only in the light of their origin and growth, can the numerous proplems of the present be viewed sympathetically.

14. It enlightens us as to how the functions and roles of social institutions have shifted from time to time.

15. It provides an important element in the professional training and equipment of the teachers and educational administrators.

16. It is an ally in the scientific study of education rather than a competitor.

17. It inspires respect for sound scholarship and reverence for great teachers.

Moreover, the history of Education seeks to answer three important questions, that is

(*i*) *The question of evolution*. For example, how did the concept of child-centred Education arise and develop ? or How did the concept of democracy enter into and develop in the field of Education.

(*ii*) *The question of resemblance*. For example, how and why Education in India is like that of U.K., and how and why Education in India is unlike that of U.S.S.R.

(*iii*) *The question of value*. For example, why should Education possess utilitarian value more than any other value ? or why should Education be a state subject and why not a concurrent subject ? or why should a Philosophy of Education grow from its own soil ?

SCOPE OF HISTORICAL RESEARCH IN EDUCATION

This method was more popular in educational research in the early thirties and forties than at present. But with the development of experimental, survey, testing and statistical procedures, this method had to surrender a large part of the field which it had monopolized for some time. However, if the use of historical method has decreased, legal research in education, which resembles historical investigation, has shown a corresponding increase in popularity over the years. The workers who formerly paid their attention to research in history of education, have diverted themselves towards the study of the specialised problems of educational legislation and constitutional provisions concerning education.

NATURE AND PROCEDURE OF HISTORICAL METHOD

There are three major processes which are involved in this method, namely :

1. Collection of data.
2. Criticism of the data collected, and
3. Presentation of the facts.

1. Collection of Data

The efforts of the historian in the collection of data are seriously handicapped because of many difficulties :

1. He has not lived at the time, and is thus removed from the events that he investigates, Therefore he must draw his data from the experiences and observations of others.

2. The recorded experiences are available in their exaggarated form and are full of superfluous details. They are praise-oriented and do not give any critical comments and judgement.

3. The recorded experiences are written from an outdated point of view and do not suit present-day requirements. The ancient historian could not have foreseen the requirements of his successors after a gap of many centuries. For example, he tried to give an overall picture of the society whereas we want specific item-wise information about education. No age is in a position to anticipate very completely the questions to which the following ages will seek the answers.

4. The records which have been destroyed cannot be created over again. The available records are incomplete and otherwise defective in several ways.

5. The historical data are not comparable to the materials of the physical sciences. They have to be reconstructed in many cases, from rather nebulous and unverifiable sources.

Sources of Data. The data have to be collected from suitable sources. Historical sources of data are usually classified into two main categories : primary sources, which are fundamental to historical research : and secondary sources, which may sometimes be used in the absence of primary data.

Primary sources. Primary sources consist of :

(*a*) Remains or relics, associated with a person, group, period or event. Fossils, skeletons, tools, weapons, utensils, clothing, buildings, furniture, pictures, paintings, coins and art objects are examples of those unconscious remains that were not deliberately intended for use in transmitting information or as records. However, these sources may provide clear evidence about the past. The contents of an ancient mound, for instance, may reveal a great deal of information about the way of life of a people—houses, food, clothing, tools, weapons, art, religious beliefs, customs, social life and means of livelihood.

(*b*) Oral or written testimony, or the records kept and written by actual participants in an event or actual witnesses of the same. These sources are consciously produced for the purpose of transmitting information to be used in the future. Documents classified as primary sources are constitutions, characters, laws, courts rulings, official records, autobiographies, letters, diaries, contracts, deeds, wills, licenses, declarations, certificates, lists, bills, receipts, newspapers, magazines, advertisements, maps, inscriptions, diagrams, books, pamphlets, films, pictures, paintings, recordings and research reports.

Secondary sources. Secondary sources are the reports of a person who relates the testimony of an actual witness of an event or an actual participant in the same. The writer of the secondary source was not on the scene of the event. He merely reports what the person who was there said or wrote. Secondary sources of data are usually of limited worth because of the usual errors that result when information is passed on from one person to another. Most of the history books and encyclopaedias are examples of secondary sources.

Some types of material may be secondary sources for some purposes and primary sources for another. For example, a high school textbook in history is ordinarily a secondary source. But if one were making a study of the changing emphasis on nationalism in high school history textbooks, the book would be a primary source of data.

Sources in Educational History. There are four important sources of educational history.

(*i*) Reports of events (called documents).

(*ii*) Physical objects (called remains or relics).

(*iii*) Artistic productions.

(*iv*) Oral tradition.

(*i*) *Documents.* There are a large number of documents or reports which are prepared for research workers in the field of Education. Some of them are : Constitutions, laws, court decisions, executive and officials orders, newspapers and periodicals, personal materials like autobiographies, memoirs, diaries, literary materials, etc.

(*ii*) *Physical Objects* like inscriptions, relics, monuments, implements, school buildings, photographs, diplomas, certificates, record blanks, maps, drawings, text-books, etc.

(*iii*) *Artistic Productions* like historical paintings, portraits, sculpture, coin types, etc.

(*iv*) *Oral Tradition* like ballads, folk songs, folk tales, anecdotes, etc.

Bibliographical and Library Procedure. Historical research involves more intensive bibliographical work and library usage than either the experimental or survey type research. The historian should soon get familiar with the method of canvassing educational literature and evidence, form for bibliography and footnotes, documentation, etc.

It is not desirable to complete the bibliography, before note taking begins. The compilation of the bibliography, the study of subject matter, and note taking may progress simultaneously throughout the course of investigation.

To make good progress in answering historical questions, the student should collect the material systematically. For this purpose he will need a well-arranged plan of note-taking.

A note-system should be flexible, that is, it should be possible to add to it at any point without disarranging the older material, and it should be possible to rearrange the notes at will. This requires that the notes be taken on separate sheets, slips or cards. Each piece should as far as possible contain a complete item but when the matter to be noted is too extensive it may be continued on successive pieces and these numbered in series. Not more than one item should ever be placed upon a single piece. Each piece should have a subject heading at the top and a margin for indexing etc. at the left.

About three different kinds of notes are made by historical workers :

(*i*) *Bibliographical note-taking.* It contains the standard data, author, title, pages, place and date of publication and other formal facts about a document. It should usually have in addition a brief analysis of the contents and some account indicating the uses and the defects of the document.

(*ii*) *Subject note-taking.* It contains one item of information about a particular topic, with the information of the source from which it was obtained. This is the most popular kind of note-taking. The great body of notes collected by any student will usually come under this head. One caution may be given here. Do not copy out long passages in readily accessible works but rather abbreviate and summarize.

(*iii*) *Method note-taking*. In collecting such material one constantly comes across suggestions or thinks of ideas which seem useful in interpreting the facts. Such suggestions or interpretative ideas do not fit into either subject or bibliographical entries, but they must be noted or they will be forgotten. Instead of taking the notes as such the investigator records his impressions and interpretations which he draws from a document. His notes consist of analysis of the information rather than the information itself.

Finally, when any extensive body of information is collected, an index and a more or less elaborate system of cross references becomes useful. Each card or sheet will indeed have at the top, a title which gives in a word or two, the particular contents of that piece. These titles themselves form a sort of index. But the cards are constantl, being rearranged. A separate index, modified from time to time, will help in the final organisation and discussion of the materials.

2. Criticism of the data collected

It has been noted that the historian cannot often employ the method of direct observation. He must get much of his data from the reports of those who witnessed or participated in these events. These data have, therefore, to be subjected to careful analysis to sift the true from the irrelevant, false or misleading.

In historical research, trustworthy data are known as historical evidence. Historians are fully aware of the limitations of the data with which they have to deal and have developed systematic means of evaluating such evidence. Generally, the criticism of historical data involves the dual processes of establishing the authenticity of the source and of establishing the validity of its contents. These are known as external and internal criticism, respectively, though the terms lower and higher criticism are also used.

External Criticism

In evaluating evidence, the historian must first establish the authenticity of his sources. External criticism is a preliminary and preparatory step, providing the data to be used in the second phase known as internal criticism. However, there is no sharp line of demarcation between these two phases of historical criticism, both progress simultaneously in many instances, with a great deal of overlapping. External criticism primarily deals with data relating to form and appearance rather than meaning of contents, while internal criticism weighs the testimony of the document in relation to the truth.

External criticism establishes the genuineness of the source as well as the data. Various tests of genuineness may be employed in order to judge whether the remain or document is a true one rather than a forgery, a counterfeit, or a hoax. The genuineness has to be ensured, lest the research worker may waste his time and labour on forged or counterfeit documents. The historian has to save himself from being the victim of spurious documents or historical fraud.

The purpose of external criticism is not much negative—that is, the detection of fraud—as it is the establishment of historical truth. External criticism, though capable of causing the rejection of a fraud, cannot prove the genuineness of a particular source except on the basis of plausibility and probability.

Among the most common problems encountered in establishing the authenticity of documents are those of plagiarism and alterations. The relatively common practice of having reports written by ghost writers also causes difficulties. A number of suggestions can be offered to the research worker in order to help him at the stage of external criticism of the documents or other sources.

1. The best tool in the detection of frauds is the investigator's commonsense combined with a healthy sprinkling of skepticism.

2. The problem of establishing age or authorship of documents may involve many intricate tests of signature, handwriting, script, type, spelling, language, usage, documentation, knowledge available at the time and consistency with what is known.

3. It may also necessitate physical and chemical tests of ink, print, paper, parchment, cloth, stone, metals or wood.

4. Various elements should be consistent with known facts about the person or event, the knowledge available and the technology of the period in which the remain or the document originated.

5. Not only the author's name and reputation but also his personality, character, position and so forth should also form one of the basis for this test.

6. The author's special qualifications and disqualifications as a reporter, *i.e.* alertness, bias etc. are some other considerations.

7. How was the author interested in the person or the event ? What were his motives in preparing the document ?

8. How was he situated for observation of the event ? Did he have adequate opportunities of observation ? Was he a competent observer ? Did he himself witness the event he described ?

9. Was the writer under any obligation, pressure or fear ?

10. How soon after the event was the document written ? For one-

purpose the century of composition may be sufficient ; for another the very moment may be essential.

11. How was the document written, from memory, after consultation with others, after checking the facts or by combining earlier rough drafts.

12. How is the document related to other documents ? How does it correspond with other competent and authentic sources ?

13. What parts of the document are original, what borrowed ? How credible are the borrowed materials ?

14. Is the authorship true or false ?

15. What is known about the author's nationality, mental characteristics, social status, vocation, class, party affiliations, religion, language, training and so forth ?

Although there may be no great temptation to perpetrate hoaxes, frauds and forgeries in the field of education, such trickery has been rather common in the field of history, literature, art, relics, antiques, business documents, natural science and exploration. Various motives operate in the case of deception :

(1) the use of a well-known name may increase the value and prestige of the document ;

(2) the reputation of prominent persons who are too busy or who lack the necessary training to write effectively may be increased by employing ghost writers, and

(3) pseudonyms may be used to mystify or to stimulate the curiosity of the readers.

It is true that since the invention and use of printing as well as photography, in the reproduction and transmission of documents, the opportunities for error are greatly decreased. Before the time of these two inventions, when manuscripts and books were copied by hand, it was relatively easy for errors of omission and commission to creep into the author's original work, which in the course of centuries passed through the hands of many different copyists. In addition to copying errors, translation of some of the documents from one language to another or from earlier to current usage, may have resulted in distortion in meaning.

In short, by every possible means, the validity of the sources must be established before their content is evaluated and used for research purpose.

Internal Criticism

After the authenticity or genuineness of a historical document or relic has been established, the next questton is to establish the validity of its contents or to determine the accuracy and value of the statements made. The external criticism evaluates the document and its genuineness in a way prior to its opening. When the investigator feels satisfied that the document is worth opening and worth studying he goes ahead and applies internal criticism after opening it and going through it. He shifts his emphasis from the document as such to the statements within the document. Proof of genuineness of a document by external criticism does not guarantee that it tells the truth from end to end or reveals a true picture.

Although much of internal criticism is textual criticism, it also involves a large number of considerations we have found important at the level of external criticism. The credibility of the writer or creator is equally important still. Was he competent, honest, unbiased and actually acquainted with the facts? Did he have any motives for distorting the details? Was he subject to pressure, fear, vanity, partiality and dogmas. How long after the event did he make a record of his testimony and was he able to remember accurately what happened? Is the witness in agreement with other competent witnesses? The circumstances under which document was written are also important. Circumstances sometimes force the writer to conceal the truth or to report only a half-truth. The work of historians, artists and poets subsidized by kings must be examined with great care—the facts may have to be sifted from the flattery. Too profuse claims of impartiality may be looked upon with suspicion. Bias is associated with such factors as religion, politics, fanaticism, regionalism, and racial antipathy. Unless the influence of such distorting factors is weeded out by a careful examination of the contents of a document, the data cannot be used as historical evidence. Externally a document may be authentic, but internally it may not yield reliable data.

Internal criticism is positive in nature when it seeks to discover the literal meaning and the real meaning of the text. The real meaning of the writing may not be the same as its literal meaning. They are usually the same in modern documents, although such is not the case for many of the older and historical documents. The usage of allegory, symbolism, irony, jests, allusions, implications, rhetorical figures, literary artifices, unfamiliar and obsolete terms and reference to strange customs and traditions are a number of difficulties which one may face in understanding these documents. A historical research worker has to cut through all these obstacles to arrive at the real meanings of the text.

Internal criticism is negative in nature when the investigator tries to seek every possible reason for disbelieving the contents of a document. The possible reasons for questioning the truth of the statements may be many. Some of them are author's (*i*) prejudices (*ii*) religious views, (*iii*) vested interests (*iv*) personal vanity or ambition, (*v*) ignorance and (*vi*) tendency to tell lies or half-truths. Apart from the author's weaknesses, some other reasons may be (*i*) occurrence of inconsistent statements within the document, and (*ii*) inconsistency of the facts contained in the document with other contemporary documents.

When there are conflicts between sources, one must depend on general credibility and give preference to the source with the greatest plausibility from the standpoint of internal consistency and agreement with other facts.

In his exacting task, the historian will have to rely partially on sources that he can no longer verify ; on many occasions he will have to rely on inferences based upon logical deduction in order to bridge gaps. At times, he will be unable to verify or to discredit the evidence before him, and yet he has to accept it or to reject it. In such cases, it is best for him to initiate his remarks with the phrase "according to ......" and thus safeguard his reputation and avoid the misuse of his status as a scientist in misleading his readers.

3. Presentation of the facts

Having established the authenticity and validity of his facts, the historian must address himself to the next task of *interpreting these facts* in the light of his problem. In this, he must be aware of the limitations of his data. Because of the relative incompleteness and unverifiability of historical evidence, its interpretation requires the historian's greatest ingenuity and imagination.

Historical causes are invariably complex, and a common error in interpretation is over-simplification. Since history is actually a record of human behaviour, causes in history are best considered on the basis of the motives of the participants. However, behaviour is based on a multiplicity of interacting motives of various strengths, a fact which makes the task of the historian relatively difficult. The problem involves the psychology of human behaviour and a historian, to be successful, should have some training in this area.

The historian must be very cautious in his use of analogy as frame of reference for interpretation. Because of the complexity of historical data, it is generally possible to draw parallels between one historical event and any number of others. But these comparisons may turn out to be risky.

In his interpretation of historical evidence, the historian should not interpret data of different cultures or different historical periods from the stand point of his personal standards.

It must be recognized that historians differ in their interpretations of the same facts.

Report writing. After the data have been interpreted, the interpretations have to be put into black and white.

Historical composition is a synthetic and constructive process that involves the mechanical problem of documentation, the logical problem of selection and arrangement of topics and sub-topics and the philosophical problem of interpretation. A good writer of educational history must possess a historical perspective, which will guide him in selecting only the relevant material and meaningful data from a mass of painstakingly gathered data. Condensation, precision, simplicity, dignity, objectivity, lucidity, synthesis, unifying theme and concentration are the qualities of a good historical narrative. Too many irrelevant or insignificant details should not be allowed to crowd out the main points. The relative importance of events and topics has to be carefully calculated and kept in mind while arranging the data in the form of a report or a narrative.

The earlier practice in historical writing presented a strictly chronological type of organization. Such organization involved a series of events broken up into short time units. The writing used to be in the nature of calendar of dates, events and names. The chapters were marked off by a period of a few months or a few years, depending upon the changes of some important nature or occurrence of some significant events.

The organisation of historical material can be done in another way also *i.e.* by *topical, thematic or functional* arrangement. Good history of education observes the conditions of good story-telling, shows purpose and meaning and provides background for better understanding of current educational problems.

It is best to combine appropriately both the above types of organisations. The preparation of a preliminary outline at quite an early stage is always helpful in the selection and arrangement of data, Once the data has been digested, the outline can of course be always revised as radically as necessary.

Weaving raw data into a cohesive, well-proportioned, colourful exposition requires panistaking labour. To achieve the twin objectives of maintaining accuracy and interest, a historian avoids dramatic flourishes that distort the truth, but tries for literary excellence. Stretching or supplementing the existing evidence to create a more spirited narrative is not permissible. The historian cannot sacrifice accuracy for eloquence ; but by developing his creative and critical skills he can learn to write lucid, lively, logical accounts without violating the rigorous rules of historical scholarship.

Factors to be avoided. The writing of history demands careful avoidance of the following factors :

(*i*) Over-simplification of facts.

(*ii*) Over-generalisation from insufficient evidence.

(*iii*) Failure to distinguish between significant and trivial facts.

(*iv*) Tendency to use secondary data.

(*v*) Tendency to accept a statement as essentially authentic when several observers agree.

(*vi*) Personal bias.

(*vii*) A dull and colourless style.

(*viii*) Failure to interpret words and expressions in the light of their usage in earlier times.

These factors to be avoided are some of the desirable precautions to be taken in historical research.

Legal Research in Education

Study of legal materials pertaining to educational problems is certainly a type of historical research. Although the concern of the school administrator and educational authority with school law is apparent, the interest of the ordinary teacher in such problems can also be justified without much difficulty. The right of the teacher to control children, the responsibility of the chemistry teacher for accidents occurring in his laboratory, the teacher's right to punish a pupil, the headmaster's right to detain a student after the school hours, the authority of the management to terminate the services of a teacher, the right of the State Government to interfere with the working of the Universities and the court's influence on the curriculum are all legal problems. It covers such topics as the legal basis of public education, relation between central and State Governments with regard to education, educational organisation in States and Districts, administration of private schools, school finance and property, legal status of teachers and pupils, text books and curriculum, legal aspects of higher education, etc.

However, the interpretation of legal problems involves an expertness that the average research scholar does not possess. The ability to find the significant controlling factors in a case, and the ability to distinguish the basic principles at stake are the competencies that require more than a superficial understanding of the law and legal procedures.

For purposes of research in education, the law may be classified into :

(1) Statutory law (constitutional provisions and legislative or statutory enactments), and

(2) Case or common law (principles applied by the courts in deciding issues not covered by statutory law).

The statutory law includes provisions written into state and federal constitutions, the legislative enactments of state legislatures and the

Parliament, and administrative laws and regulations promulgated by appointed bodies and commissions.

The case or common law includes the principles established by the courts in deciding issues not covered by statutory law, but based upon sound principles of public policy.

The task in legal research is to find and summarize pertinent statutes, to trace further legal developments through related court decisions and finally to analyze the decisions in the light of the problem being investigated.

The following can be specifically suggested as the fields of legal research :

1. Constitutional provisions for education.
2. Educational legislation and Education Acts in different states.
3. Systems of grants-in-aid.
4. University Acts.
5. Acts of School Education Boards.
6. Rules for admission to various courses.

The January 1966 issue of 'Education' published from Lucknow is devoted to legal aspects of the problem of security of service. The issue gives various cases under the following heads alongwith the court judgements :

1. Improvement of security of service.
2. Rules of Natural Justice.
3. Contracts of Service.
4. The Legal Hurdle.
5. Statutory Provisions.
6. Constitutional Provisions.
7. Double Opportunity.
8. Security and Transition Period.

All over the world an adequate number of studies have been made of legislative enactments and constitutional provisions for the school, and of the history of educational legislation, but the organisation of case law (decisions of the courts) concerning school issues has been rather neglected. Much of the law in which school people are interested is found in court decisions.

NINE

Normative Survey Method

George J. Mouly has said—"No category of educational research is more widely used than the type known variously as the *survey*, the *normative-survey*, *status* and *descriptive research*. This broad classification comprises a variety of specific techniques and procedures, all similar from the standpoint of purpose—that is, to establish the status of the phenomenon under investigation".

The descriptive or normative-survey method of educational research is very common. It is that method of investigation which attempts to describe and interpret what exists at present in the form of conditions, practices, processes, trends, effects, attitudes, beliefs etc. It is concerned with the phenomena that are typical of the normal conditions. It investigates into the conditions or relationships that exist, practices that prevail, beliefs, points of view or attitudes that are held, processes that are going on, influences that are being felt and trends that are developing. It is an organized attempt to analyze, interpret, and report the present status of a social institution, group or area. It deals with a cross-section of the present, of duration sufficient for examination—that is, present time, not the present moment. It seeks to answer the question, "What are the real facts with regard to the existing conditions". For example, an administrator may want to know how many of the teachers in his system have Master's Degree? How do these figures compare with the tendency througout a province, or throughout the country? How many hours per week are normally devoted to the teaching of mathematics? What is a reasonable cost for the education of a kindergarten child? What kind of a curriculum do people really want their children to have? The teachers however, are concerned with the conditions obtaining in their classrooms and give frequent tests of one kind or another to keep informed of these conditions.

The compound adjective 'normative-survey' is applied to this method in order to suggest the two closely related aspects of this kind of study. The word 'survey' indicates the gathering of the data regarding current conditions. The word 'normative' is used because surveys are frequently made for the purpose of ascertaining which is the normal or typical condition or practice.

A fairly clear line can be drawn between survey studies and historical studies on the basis of time : the latter deals with the past, the former with the present. Surveys differ from experimental studies in purpose. Surveys are oriented towards the determination of the status of a given phenomenon rather than towards the isolation of causative factors. Survey studies differ from case studies in that surveys are generally based on large, cross-sectional samples, while case studies are oriented to the more intensive and longitudinal study of a smaller sample.

While surveys are on the whole, relatively less scientifically sophisticated than most other research techniques, they vary in complexity and sophistication. At one extreme, they constitute nothing more than a clerical fact-finding approach to the study of local problems without any significant research purpose—for example, a survey of the academic qualifications of school headmasters. At the other extreme are surveys that involve significant interrelationships among phenomena. Surveys of the reactions of inmates of concentration camps, for example, have provided definite insight in the psychology of the human personality under conditions of psychological stress.

Worthwhile survey studies collect three types of information :

(*i*) *of what exists* by studying and analyzing important aspects of present situation.

(*ii*) *of what we want* by clarifying goals and objectives possibly through a study of the conditions existing elsewhere or what experts otherwise consider to be desirable, and

(*iii*) *of how to get there* through discovering the possible means of achieving the goals on the basis of the experiences of others or the opinions of experts.

CHARACTERISTICS OF NORMATIVE-SURVEY METHOD

1. It is essentially cross-sectional.

2. It gathers data from a relatively large number of cases.

3. It is concerned not with the characteristics of individuals but with generalised statistics of the whole population or a representative sample.

4. It deals with clearly defined problems and has definite objectives. It requires an imaginative planning, a careful analysis and interpretation of the data and a logical and skilful reporting of the findings.

5. It does not aspire to develop an organized body of scientific laws but provides information useful to the solution of local problems.

It may, however, provide data to form the basis of research of a more fundamental nature.

6. As already mentioned, surveys vary greatly in complexity, some concerning only with the frequency count of events, while others seek to establish relationship among events.

7. Surveys may be qualitative or quantitative. At one level surveys may consist of naming and defining the elements of various phenomena, e.g. the qualities of a good administrator. At another level they may involve ascertaining the amounts of constituents or the number of students falling in the categories of distinction, first class, second class, third class and failure.

8. Descriptions resulting from surveys may be either verbal or expressed in mathematical symbols.

9. The vast range of phenomena forming the subjects of educational surveys may be classified as:

(*a*) Physical conditions related to learning (campus, building, furniture, etc.)

(*b*) Behavioural conditions related to learning (behaviour of pupils, teachers, headmasters, etc.)

(*c*) Pupil's ability to learn or the results of learning (achievement, basic skills, information, attitudes, etc.)

10. It fits appropriately into the total research scheme or the stages in exploring a vast and intricate field of investigation. It may

(*a*) serve as a reconnaissance or getting acquainted stage of research in entering a new area, or

(*b*) represent a specific interest in current conditions within a field that has long since been explored and developed by research.

11. It is not notably forward-looking, but it may be of service in this direction. It may call attention to current trends and permit people to evaluate and direct these new tendencies which are taking shape. It may also perform an important function in giving pertinent data to persons who are forward-looking. It may reveal practices or conditions which are well above the average, representing advanced thinking and administration, a forward-looking worker should always be alert towards them.

12. It does not characteristically penetrate deeply into interrelationship. It stops with the disclosure of facts and a suggestion of relatively prominent connection between these and apparent causes. The full analysis of complex interrelationships in natural situations demands other methods especially adapted to a study of causal relationships.

13. It is more realistic than the experiment in that it investigates phenomena in their natural setting.

PURPOSES OF SURVEYS

1. Educational surveys are particularly versatile and practical, especially for the administrator because they identify present conditions and point to present needs. May be, they cannot make the decisions for the administrator, but they can provide him with informations on which to base sound decisions. They provide, therefore, the basis for decisions for improvement.

2. It serves as a stepping stone to more precise investigations. The investigation of any problem must begin with a survey of its nature before it can move into the more structured and rigorous phases.

3. At its most elementary stage, the survey is concerned with determining the immediate status of a given phenomenon. Eventually it is concerned with the derivation of hypotheses to be incorporated into more adequate investigations at the experimental level. Thus, its purpose is both immediate and long-range.

4. It secures historical perspective through a series of cross-sectional pictures of similar conditions at different times.

5. It suggests the course of future developments. It gives pertinent data to persons who are engaged in planning for the future.

6. Since it is rarely possible to achieve control of extraneous factors within the setting of the natural situation, the survey is not generally capable of testing specific hypotheses. It represents, rather a step of intermediate scientific sophistication by which semi-crude relationships among phenomena are explored.

7. Its purpose is to prepare background for a constructive programme of educational research as also the removal of immediate evils. It provides ideas or data from which many more refined laboratory or controlled studies of causal relations are made.

8. A survey may be general or specific. It may be purely utilitarian in nature or may have academic importance aimed at verification of some established theory or any of its corollaries.

9. It helps fashion many of the tools with which we do research, e.g. the development of instruments for measuring many things in quantitative research as well as various data-gathering instruments like check-lists, schedules, score cards and rating scales.

10. It contributes to the advancement of knowledge in many ways. For example, by studying children of different ages, we can obtain some picture of the trend of child development.

CLASSIFICATIONS OF NORMATIVE SURVEY RESEARCH

Normative survey researches may be variously classified, either on the basis of the fields they study, the purposes they achieve, the geographical areas they cover, or the techniques they employ. According to the fields of study we come across social surveys, commercial surveys, community surveys, regional surveys, district level surveys, urban area surveys, national surveys or international surveys. In view of the techniques employed, there are six types of surveys. Just as there are different kinds of sources for these facts, so there are many procedures which have been developed to meet the needs of different purposes and conditions. Thus, when one desires facts from people about themselves, he may interview them, ask them to submit to a test or examination or to produce something evidencing their skill or interest. In all six different types of normative-survey research are recognized when the basis is the technique employed. These are :

1. Survey testing,
2. Questionnaire inquiries,
3. Documentary frequency studies,
4. Interview studies,
5. Observational studies, and
6. Appraisal procedures.

Keeping in view the specific nature of the field of education, the normative surveys are classified as under :

(*i*) *the major aspects of the school systems they study* : school plant, school time table, school products, educational outcomes like behaviour, attitudes, etc.

(*ii*) *the geographical areas they cover* : local, state, national, etc.

(*iii*) *the levels of instruction they investigate into* : pre-primary primary, secondary, university, etc.

(*iv*) *the type of preparation they aim at* : general, teacher training, engineering, medicine, etc.

(*v*) *the purpose they fulfil* : follow up of the youth after school, membership of a teachers association, characteristics of a group of institutions, opinions of a group of parents, etc.

(*vi*) *the data gathering techniques or procedures employed* : questionnaire, interview, etc.

We have now to discuss in some detail the educational surveys of different types which are currently undertaken in the educational world :

School Surveys. "It can be well said that no other unified undertaking so fully represents the normative-survey method of research in all its various phases as does the school survey". School survey of the comprehensive type covers such aspects as :

1. Aims, curriculum, methods and instructional aids, outcomes, pupil achievement.

2. System of administration, administrative problems. administrative deficiencies.

3. Physical plant, its operation and maintenance and allied facilities.

4. Pupil transportation.

5. Staff and personnel.

6. Management.

7. Role in the community.

8. Historical background.

School surveys utilize in one instance or another the whole range of normative-survey procedures. Caswell analyzed the techniques which were commonly used in surveys. His list and description of techniques follows :

1. Analysis of available basic data. All cases in which data were secured from any regularly prepared record, report or documents were included under this heading.

2. Score card and rating scale. Any scheme whereby various elements in a situation were listed and weighted or evaluated was included under this heading.

3. Standard tests. Both intelligence and achievement tests were included under this heading.

4. Case study. Whenever an individual pupil was studied and his case used as evidence to support a conclusion, this was classified as a case study.

5. Experimental procedure. Whenever groups were equated with respect to a variable characteristic.

6. Interview or questionnaire. Whenever data were collected by means of conversation or by means of forms filled out by certain subjects.

7. Observation. Whenever the basis upon which a problem was solved was a subjective examination.

A school survey is commonly conducted in order to determine the services that a school can render to community and perhaps to compare these services with those that are provided by other schools. The ultimate aim of all school surveys is educational progress which they achieve by focussing attention on unfulfilled needs or noticed evils of a school system on the one hand and of worthwhile practices on the other. They appraise the efficiency of a system and of the personnel and help in determining the next desirable steps. Though employing procedures and tools (check list, questionnaire, etc.) which are not highly objective, and which involve a considerable element of subjectivity, school surveys yet, have real worth and value as they focus personnel opinion and reactions on the important problems of a school.

School surveys may be concerned with the problem of school building only. They study community and school setting, estimate further school enrolment, school plant planning, available financial resources for extension and maintenance of the buildings, etc. Other surveys may concern with the direct educational problems of instructional programme—aims and objectives, curriculum and methods, aids, activities and achievement.

School surveys have been sponsored and undertaken by a variety of groups and organizations like local or district authorities of education, state or national bodies of education, departments of education, and the like. An individual investigator, working alone, can seldom attempt comprehensive school survey except in a very small school system. However, many researchers have worked out worthwhile functional theses and dissertations through participation in comprehensive educational or school plant surveys.

Procedure or Steps of School Surveys

1. Selection of the problem. The first step is the selection of a suitable problem for investigation. The problem should be of immediate concern to the persons engaged in the process of education, to the society and to the general educational set-up. The survey research is more or less organised as institutional research than individual research. Hence its problem and scope should be decided in consultation with the administrators, teachers, higher authorities and the public men interested in education. After its location, the problem has to be clearly formulated, defined and delimited.

2. Preparation of the plan. The plan of action has to be drawn up to ensure scientific and objective merits of the study. The geographical area to be covered, the sample to be selected and the data collection team to be organised, all such items of plan will be clearly drawn out. It will also be decided whether survey would be purely cross-sectional, longitudinal or both.

3. Preparation of tools. The tools of investigation generally used are : questionnaires, attitude scales, community study, and the like. Specific investigation would require specific tool/tools of inquiry. The already available tools will be scrutinised to select a reasonably suitable tool out of them. In case no readymade tool is available, a suitable one will be prepared in a systematic manner. The tool should be tested in a pilot study before it is administered to the vast sample.

4. Data gathering. The data will then be collected from the proposed group of persons or sources with the help of the tool to be employed in the study. The participation of teachers, administrators and interested public men is imperative to ensure comprehensiveness and authenticity of the data.

5. *Analysis and interpretation of data.* Depending upon the extensiveness of the survey data and upon the nature of the material collected, the handling of the data usually takes one of the following forms :

1. analysis direct from the survey forms or the tool employed,
2. transference of the data to ordinary cards,
3. the use of specially prepared cards with holes, and
4. the use of punched cards.

The scattered data has to be brought into a system before any further treatment is made.

Analysis of data comprises various approaches designed to dissect the phenomena into their constituent parts with a view to obtain greater insight into specific aspects. The statistical analysis of the data is principally based on counts of numbers of units that fall into different classes and subclasses. Where quantitative responses have been obtained, totals for the classes are secured. From these numbers and totals the arithmetical means can be computed for the different classes. Basic summary tables can then be compiled. In these tables, for example, the frequencies resulting from the counts may be expressed in percentages. The bases of these percentages are chosen so as to show the differences in percentages that are of interest. More critical analysis can now be applied to the data. Usually this further analysis is employed so that the effects of the various factors on which data were collected and which are believed to influence the results may be isolated.

Often there is in addition to the numerical data, important qualitative information which may not be given any statistical treatment but may be presented and interpretted in a descriptive way.

6. *Preparing the report.* The reporting of descriptive research may be spread over six steps :

(*i*) Introduction—Need and importance of the study.
(*ii*) The Problem—Background, selection, definition, etc.
(*iii*) Tools and Data Collection—Preparation and use of tools, etc.
(*iv*) Analysis and Interpretation—Statistical treatment of the data, etc.
(*v*) Review and Recommendations—Retrospect and prospect of research, principal findings and relevant recommendations.
(*vi*) Appendices—Details of the sample, The Tools, Bibiliography, etc.

SAFEGUARDS FOR SCHOOL SURVEYS

1. The Survey agency should conduct the survey in a completely objective fashion without pre-determined findings.

2. Survey should be entrusted to the people who are familiar with the field.

3. All purposes, objectives and procedures of the survey should be discussed prior to the beginning of survey.

4. A meeting of all the experts and survey-team should be held to discuss the actual strategy to be adopted in the field.

5. Only competent and experienced teachers should constitute the survey-team.

6. An adequate staff should be employed to carry out the survey.

7. Local teachers, administrators and interested citizens should be carefully involved in the survey process.

8. The survey should not be rushed through. It should be unhurried and adequate time should be spent on its various phases like conferences, consultations, data gathering, etc.

9. The survey outcome should be viewed in the light of local historical perspective, as well as economic, political and sociological factors.

10. The entire data to serve as a basis for the survey report should be checked.

11. The recommendations should be objective, clear and constructive rather than fault finding.

TEN

Survey Testing

Perhaps the commonest example of normative-survey research in education is survey testing. By survey testing we mean simply the testing of a group of persons to ascertain the prevailing condition with respect to the traits measured by the test. A teacher may give tests to the pupils in his class to discover the general level of the class performance. Similarly tests may be given to the pupils in a group of schools, in a city, in a state or larger area ; and some testing surveys have been international.

Every year, school systems spend lakhs of rupees to appraise the outcome of their teaching efforts. In addition, in some systems of schools there exists a highly organised programme of pupil appraisal in intelligence, special aptitude, personality adjustment and vocational interest.

A distinction needs to be made between the guidance function and the research function of such testing. These functions are not altogether independent of one another, but we are concerned here only with the latter. Research is interested in groups that is, it attempts to derive generalizations which are applicable beyond the individual case. Survey testing, as a research activity, is interested in comparing the achievement of the group—a class, a school, or a system—with the group on which the test was standardized. In contrast, the guidance approach is interested in the child as an individual. It is true that diagnostic and prognostic uses of tests emphasize study of the performance of individuals. To be considered research, survey testing, of course, must be conducted with reference to some clearly defined problem ; such as the common errors of pupils in a particular subject in a particular class.

USES OF SURVEY TESTING

1. It is employed for the actual study of tests themselves *i.e.* their characteristics, their construction and their method of administration.

2. They may be employed to furnish measurements for some other method of research, such as experimental research.

3. The benefits to be derived from periodic appraisals of the work of the school are undoubtedly great. Such studies point out gaps and weaknesses in the programme and serve to keep the whole system alert.

4. They give us objective and impartial information about a subject in much less time than provided by any other device.

5. Their use has eliminated a great deal of subjective element in measuring pupil differences.

6. Since there is a definite way of expressing the results of these tests in the form of standard scores, these have the same significance for all the teachers and guidance workers and all of them draw the same interpretations from them.

7. Through their objective information, it becomes easier to convince the guardians of the children about the assets and limitations of their wards.

8. Tests, if chosen judiciously, facilitate self-analysis.

CLASSIFICATION OF TESTS

Depending upon purposes to be served, the testing material to be employed and the level of sophistication to be secured, the tests to be used in research are of various types. They are :

Intelligence Tests. Which can be further classified as

(*a*) *Individual* : When administered to one person at a time.

(*b*) *Group* : When administered to many examinees at the same time.

(*c*) *Performance*. When testing is done through actions and not through use of language.

(*d*) *Paper and Pencil*. When the test takes a written form.

Educational Achievement Tests. Which are further classified as :

(*a*) *Survey* : When comprehensive examinations are used to determine general academic standing.

(*b*) *Subject* : When achievement is to be tested only in a specific subject field like Mathematics, etc.

(*c*) *Diagnostic* : When the tests are given to cover a wide range of academic skills to reveal specific strengths and weaknesses.

Aptitude Tests. Further divided as under :

(*a*) *General* : For example, mechanical ability, clerical ability, etc.

(*b*) *Special* : For example, ability in specific subjects like mathematics, foreign language, etc.

(c) *Professional*: For example, ability in professions like Law, Medicine Teaching, etc.

(d) *Talent*: For example, ability in fields like Fine Arts, Music, etc.

Tests of Various Aspects of Personality. These are also further subdivided as under:

(a) *Personal Adjustment Questionnaires*: Survey of worries, fears, social inadequacies, etc.

(b) *Attitude Surveys*: Surveys of attitudes upon social, economic and political questions.

(c) *Interest Inventories*: Related to various occupations.

(d) *Environmental facts related to Personality*: Assessing socio-economic background and other variables.

(e) *Projective Techniques*: Subtle and indirect measures of dominant personality trends.

Another way of classification

(*i*) Standardized vs. Non-standardized.
(*ii*) Power vs. Speed.
(*iii*) Individual vs. Group.

Standardized Tests. We have another two-fold classification of Standardized and Non-standardized tests. The standardized tests can cover the contents of all types of tests mentioned above, but the condition is that such tests are prepared, administered, scored and interpreted in a well-determined scientific manner. They are more popular in the field of achievement testing. They ensure objectivity, reliability and validity.

Non-standardized Tests. These can also be framed and used to measure any of the above mentioned traits and outcomes. They are the tests which are not prepared in the scientific way necessary in the case of standardized tests. Any worthwhile test can be placed in this category. We are not sure of their objectivity, reliability and validity.

TEST CONSTRUCTION

Survey testing or any type of testing requires a pre-constructed test. Every available test or every test prepared off-hand cannot be a fit tool for testing. It is only a scientifically prepared test which can ensure a scientific survey testing. A good test is a pre-requisite of research of the type of survey testing. Various qualities are desired in a good test which necessitate a careful test construction and its standardization. In a way, it will be objectionable to carry out survey testing through the tool of a non-standardized test. This standardization has to be done through the following steps:

Steps of Standardization

1. Planning the test.
2. Preliminary draft.
3. Testing the test.
4. Item analysis.
5. Final draft.
6. Deriving norms.
7. Establishing validity and reliability.

1. *Planning the test.* The first question before us is : which abilities, proficiencies, behaviours, etc. constitute the trait to be tested ? In the case of curricula, what are the various objectives ? For example, there are six main areas in which these objectives or learning outcomes are divided in achievement testing : (*i*) Knowledge, (*ii*) Comprehension, (*iii*) Application (*iv*) Analysis, (*v*) Synthesis and (*vi*) Evaluation. When we are concerned with achievement testing in a particular subject, the instructional objectives for that subject will depend upon the nature of the subject. As a further illustration we can say that the following objectives will suffice in an achievement test in mathematics : (*i*) Knowledge, (*ii*) Computation, (*iii*) Understanding, (*iv*) Problem solving, (*v*) Creative thinking, (*vi*) Appreciation (*vii*) Interests, (*viii*) Scientific attitude, (*ix*) Habits and (*x*) Drawing skill.

The research worker has to fix weightage at three stages :

(*i*) He has to fix weightage for each of the objectives or learning outcomes.

(*ii*) He has to assign relative weightage for each content area.

(*iii*) He has to decide the type of items to be used and weightage for each one of the types.

Test construction must start by a consideration of the limitations under which the test must be produced. The test maker has to work under given conditions which are in no way ideal conditions. The work must begin by a detailed set of specifications as to the purpose of the test and the time, money and personnel at the disposal of the test maker. The population for which the test is to be made has to be defined. Then the purpose of the test is stated and in the light of this the type of test item to be used to measure the given trait or function is to be selected or devised. There is as infinite a population of possible items as there is of possible examinees and the problem of sampling will arise in both spheres. These preliminary set of considerations are known as *test specifications* and to the extent these are clear and unambiguous, further progress will be smooth and orderly without any need for revision and second thoughts. This is a task requiring ingenuity in the test maker and familiarity with the existing tests. The length of the test is also to be decided because on it depends the cost, in terms of time and money, of giving and scoring the test and interpreting the results.

2. *Preliminary Draft*. It is the second phase of the work of test construction. The test framer considers the types of the items available to him and is in fact free to create original items of his own to cover the function or trait adequately. The familiarity with the existing tests is a prime necessity at this stage. He has to consider the pattern of response expected. For economy the response sheet is separated from the test booklet. Whether the response is given by indicating one of many alternatives as correct or by inserting the answer, has to be decided. Once the types of items have been fixed, the test-maker must compile a large number of items of suitable difficulty. A rough idea of this can be obtained by trying a few items on a small group of examinees from the population. More than double or even three to four times the items necessary for the test must be collected. These are then prefaced by carefully worded instructions which indicate briefly the nature and purpose of the test, the nature of the task with a few examples and exercises which are completed before the proper test is begun. This first draft of the test is then submitted to superiors or coworkers for frank opinion and criticism. Many false assumptions, slips and oversights are caught out in this process. It is better to administer the preliminary draft to a small, say 30—50, examinees and check the answers. A few further modifications may be suggested by this procedure. After these have been incorporated, the preliminary draft is ready for the press or for cyclostyling.

3. *Testing the Test*. This next stage is also known as the *try-out*. The preliminary draft is administered to a large random sample of the population for which the test is being made. The size of the sample is fixed with an eye to the quick and easy derivation of subsequent indices of difficulty and discrimination which are used for picking out good items for the final test. There are various methods of deriving these indices for items and some tables and monographs have been prepared to facilitate the finding of these values. The size of the sample for try-out will depend on what method or ready reckoners one intends to use for item-analysis. For example, there are tables connected with the performance of an item of the top 27 per cent and the bottom 27 per cent cases of the sample. Since later the percentage of these top and bottom 27 per cent cases passing and failing an item are used, it will be economical to have a size of sample, 27 per cent of which will be about 100, so that the percentage of failures and passes of these top and bottom 100 are automatically calculated. Thus if a sample of 370 is used the top 27 per cent and the bottom 27 per cent of it will give us 100 best and 100 worst persons. The table can then be consulted to read out the indices directly.

The try-out is timed so that in an increasingly difficult test nearly 90 per cent complete the last item. The scripts are next collected and scored against a ready-made key. Hand scoring is slow and liable to chance error which should be checked by re-scoring a few sample batches of scripts.

4. *Item analysis*. The next phase is concerned with item analysis which is a technical name for deriving for each item or question of the test two indices—one of its difficulty and another of its power to discriminate between the good and bad performers on the test. It may also work out the effectiveness of all the alternative responses. One begins by arranging the scripts from the highest to the lowest obtained score. The scoring is done on the principle of awarding one score for each correctly attempted item. If the items are of the multiple choice type, the question of winning scores by taking chances blindly with the provided alternative arises. If most examinees complete all the items there is no need to worry about guessing as the advantage is equal for all. Only when the number of unattempted items is large, the question of correction for guessing will arise. The correction for guessing can be made by the formula ; $\text{Score} = \text{Right} - \frac{\text{Wrong}}{n-1}$, where n is the number of alternatives in each item. From the arranged scripts the top 27 per cent and the bottom 27 per cent are separately taken. The two groups are named as the upper group and the lower group respectively. Let us say that there are 20 cases in each of the groups. The data about an item may be tabulated as under :

	Alternatives	A	B*	C	D	E
Item No. 1	Upper 20	0	11	6	3	0
	Lower 20	5	2	5	8	0

Alternative B is the correct answer. Out of the upper 20, eleven have done it correct and out of the lower 20 only two have done it correct. The difficulty value of the item can be calculated thus :

$$\text{Percentage passing} = (11+2) \text{ or } \frac{13}{40} \times 100 = \frac{65}{2} = 32{\cdot}5\%.$$

From the Table of Area under the normal probability curve we can read the difficulty value as $0{\cdot}93\sigma$.

Best percentage passing would be when all the 20 cases of upper group attempt it correct and all the 20 cases of the lower group attempt it wrong. Therefore,

$$\text{Best percentage passing} = (20+0) \text{ or } \frac{20}{40} \times 100 = 50\%.$$

Thus best difficulty value $= 0{\cdot}00\ \sigma$.

Worst percentage passing would be when all the 20 cases of upper group and all the 20 cases of the lower group attempt it incorrect. Therefore, Worst percentage passing $=\frac{0}{40}\times 100=0\%$ or even $\frac{40}{40}\times 100$

$=100\%.$

Thus worst difficulty values are : $+3\,\sigma$ and $-3\,\sigma$.

The Index of discrimination of this item can be written as :

Index of discrimination $=\frac{11-2}{20}=\cdot 45$

Best index of discrimination $=\frac{20-0}{20}=1\cdot 00$

(Note that this item will then have the best difficulty value also, which is $0\cdot 00\,\sigma$).

Worst index of discrimination $=\frac{0-20}{20}=-1\cdot 00$

Zero discriminating power (0·00) is obtained when an equal number of students in both groups get the item right and negative discriminating power when more students in the lower group than the upper group get it right. Both types of items should be removed from the general achievement test and be discarded or improved.

The finding of *effectiveness of the distractors* is another requirement of item analysis. The effectiveness of the distractors is found by comparing the number of students in the upper and the lower groups who selected in each correct alternative. A good distractor will attract more students from the lower group than the upper group. Alternatives A and D are functioning effectively, alternative C is poor since it attracted more examinees from the upper group than from the lower group, and alternative E is completely ineffective since it attracted no one.

Obviously, we should favour an item at 0·00 σ difficulty value, with the corresponding high (close to +1 00) discriminating power and with all the distractors functioning effectively.

5. *Final Draft*. On the basis of the two indices, one of difficulty value and the other of discriminating power and also the effectiveness of all the alternative responses, items to go into the final draft of the test are picked out. This final draft is then ready for administration to the examinees for the purpose of standardization. The final form is timed again so that approximately 90 per cent of the population completes the test in the given time without feeling unduly rushed. The test has to be administered to a fairly large sample of the population for developing the well known test parameters of norms, reliability and validity.

6. *Deriving Norms*. Derivation of norms constitutes a distinctive feature and an inseparable part of the process of standardization of a test. It is through them that the scores on a standardised test can be

meaningfully interpreted. Norms are representations of average or common performance based upon the results of testing a specified group of students. They are nothing but results obtained by specified group on a specified test. With their help we can interpret the score of any student and can know how well he has performed on that test.

Depending upon the purposes and nature of the test under standardization, different types of norms may have to be employed, which are standard score norms, percentile norms, grade norms, age norms, etc. For example, if the raw scores of the reference group on the test are converted into standard scores, the norms we get are called the standard score norms, if they are converted into percentile ranks, the norms will be the percentile norms and if they are converted into grade-placement scores they will be called grade norms.

An important precondition for setting up norms is a clear understanding of the kind of student population for whom the test is meant.

The basic standard score is z. All other standard scores can be derived from it. In this derived score the mean and the standard deviation of the distribution of scores are reduced to zero and 1 respectively.

Algebraically we can say $z=\frac{X-M}{\sigma}$

Where X=the raw score
M=the mean, and
σ=the standard deviation.

The difficulty with z-score, however is that nearly half the scores will be negative. Thus if the mean and standard deviation on a test are 60 and 20 respectively, the z-score corresponding to a raw score of 80 will be $\frac{80-60}{20}$ or 1, while the one, corresponding to a score of 50 will be $\frac{-10}{20}=-\cdot5$.

Several variations of the z-score are being used in order to eliminate negative or fractional scores. One such variation is referred to as the Z-score. It can be derived from the z-score as under :

$$Z=10\,z+50.$$

The percentile rank indicates a pupil's relative position in a group in terms of the percentage of pupils scoring below him. If a student whose raw score of 129 is better than 80% of the students in a group with which he is being compared, then his percentile rank will be 80. It can very easily be estimated from the frequency distribution, with cumulative frequencies of different intervals. All that is required is the percentage of cumulative frequency below a particular point.

Normalized standard scores is a compromise between percentile ranks and linear standard scores. They are derived scores which are assigned standard-score like values but which are computed more like percentile ranks. One of the best known scores of this type is the T-score. These T-scores have a mean of 50 and a standard deviation of 10 and their distribution is always normal. If the distribution of raw scores itself is normal, there will hardly be any distinction between T-scores and Z-scores. T-scores can be calculated by using the formula $T=10z+50$.

Stanine scores are another type of standard scores. They imply a standard score scale of nine units. They represent bands of values, each band being equal to one-half of the standard deviation in width with the exception of open-ended extreme stanines. The stanine scores can be easily calculated by arranging the students in ascending and descending order with the help of raw scores.

A grade-placement score is another norm. A grade-placement score corresponding to a particular raw score is the grade level of those pupils whose average raw score is the raw score in question. It is generally reported in terms of two numbers, the first representing the year and the second the month. For example, if the average score of students tested after the fourth month of the 5th grade is 69, then the grade placement score corresponding to a raw score of 69 will be represented by 5·4. The grade placement score of a student studying in the fourth grade can come out to be 5·0, but it does not mean that he should be promoted to 5th grade. Based as they are on the average score, some of the students in that particular grade are bound to be above the average while others will be below it.

Age-scores or age-equivalents are similar to grade-placement scores. Since they are related to age, they are most appropriately used in connection with characteristics or traits which tend to increase progressively as the child grows older. The age-score corresponding to a particular raw score is the chronological age of those pupils whose average raw score is the same as the raw score in question. Thus if the average score on a test by a group of students of age 9 years and 7 months is 55, then the age equivalent of the raw score of 55 on the test will be represented by 9-7.

7. *Establishing validity and reliability*. Both of these measures are the coefficients of correlation. Reliability is the correlation of the test with itself and validity is the correlation of the test with a test already standardised for measuring the same trait for which the test under standardization in intended. These are calculated by various formulae for the coefficients of correlation as well as by some specially designed formulae for the purpose.

INTELLIGENCE TESTING

Intelligence tests claim to measure the factor of native brightness, or capacity for intellectual adaptation, as it varies from individual to individual. It is generally recognized that these tests are not free from the influence of formal training and general experience so that scores represent a composite of native and experiential factors.

In individual school systems, intelligence tests are largely employed as a basis for dividing large classes into relatively homogeneous sectoins, as an aid in the diagnosis and adjustment of individual children in educational and vocational guidance, and in other ways. The opportunity for research in this area is almost unlimited, though one will recognise that intelligence tests furnish only one line of evidence.

Intelligence tests have received a great deal of use in the estimation of aptitude. Their applications have been made to the estimation of general scholastic success, the probability of success in higher courses, aptitude for particular subjects, future ability in various vocational fields

Perhaps the largest use of intelligence tests has taken place in the field of scientific experimentation and study. This is probably because intelligence testing lies primarily in the field of psychology, and psychologists are concerned chiefly with the development of their science rather than with immediately practical applications. This emphasis is somewhat in contrast to the stress in the field of educational or achievement testing, which has been almost entirely in the hands of educators.

A number of large-scale studies utilising intelligence tests have been made. For example, surveys of intelligence have been conducted to ascertain the average intellectual level of pupils who enter college, of pupils who do not succeed in schools, etc. Intelligence tests are among those given in state-level testing programmes, particularly for the purpose of college entrance. They have also been used in school surveys.

There are different types of intelligence tests such as individual versus group ; and verbal versus performance.

The different intelligence tests are also scientifically prepared and standardised. Their reliability, validity and norms are also established. However they are not culture-free tests. Hence tests standradized on the population of a country may not be directly applicable to the people of another country. If intended to be used in another country they have to be adapted and restandardized by taking an adequate sample from the new population and local norms have to be evolved.

The intelligence tests are prepared for different year levels. Currently the practice is to combine the verbal and performance scales. The total weightage on the two combined scales yields the mental age of the individual which will be converted into an I. Q. (Intelligence Quotient). An I. Q. of an individual is supposed to be constant. The individual tests are uneconomical in the sense that they are to be administered to the subjects individually which is time-consuming. The group tests of intelligence permit simultaneous administration to a large number of subjects. Administration and drawing of inferences require a certain amount of training on the part of researchers for the intelligence tests necessitate clinical observation also. It is essential to use locally standardized intelligence scales to get reliable and valid results.

Some of the well-known foreign and Indian Intelligence Tests are mentioned below :

—The Stanford-Binet Intelligence Scales.

—The Wechsler-Bellevue Intelligence Scales for Children.

—The Stanford Hindusthani Revision of Patna Training College.

—The Jalota's Group Verbal Tests.

—The Bhatia's Performance Tests of Intelligence.

—The Hundal's Verbal Tests.

APTITUDE TESTS

Aptitude tests attempt to predict the degree of achievement that may be expected from individuals in a particular activity. To the extent that they measure past learning, they are similar to achievement tests. To the extent that they measure non-deliberate or unplanned learning, they are different. Aptitude tests attempt to predict an individual's capacity to acquire improved performance with additional training.

Intelligence tests are also a kind of aptitude tests as they describe and measure the general ability which enters into the performance of every activity, and thus predict the degree of achievement that may be expected from individuals in various activities. But the term aptitude test is more commonly reserved for the tools which measure and describe special abilities, capacities or talents. These special abilities are supposed to determine the level of achievement that can be expected from individuals in specific fields of study and activity.

Intelligence which is generally thought of as inborn potentiality, is really measured by present ability. Whether one's achievement is relatively high, average, or low, we assume that it is a measure of how effectively one has profited from one's informal opportunities for learning. This is a matter of inference rather than of direct measurement. Since it has proved useful in predicting future achievement, particularly in academic pursuits, we consider this concept of intelligence measurement a valid application.

Aptitude tests have been similarly designed to predict improved performance with further training. Like intellegence, aptitude also cannot be measured directly. It can only be inferred on the basis of present performance. For constructing an aptitude test in Music, for example, one has to consider the factors which enter into good, musical performance—ability to remember and discriminate between differences in pitch, rhythm, pattern, intensity, etc. and to include items which would measure an individual's standing with regard to such factors. Such like inferred measures have also been applied to mechanical and manipulative skills, artistic pursuits, and many professional areas.

As already stated, the principles underlying the aptitude tests are the same as those employed with tests of intelligence in respect of sampling of performance, population samples and standardization techniques.

For example in the case of motor and Mannal Tests, Hand Dynamometer is used for measuring strength of grip which also determines degree of handedness and rate of fatigue. Reaction time is another relevant measure which is the time interval between the onset of a stimulus and the beginning of the person's overt intentional response. To achieve competence in activities requiring manual dexterity, speed of gross movements of hand and arm, manual rhythm and coordination, and finger control and coordination are necessary in varying degrees. Factor analyses of data obtained with tests of motor activity have produced results that are consistent with what would be expected by one who is familiar with these devices. The factors are—fine coordination, finely controlled motor adjustments using large muscles, arm-hand steadiness i.e. unspeeded, precise, coordinated movements of arm and hand ; manual dexterity i.e. speeded arm-hand movements with large objects. The tests like Crawford Small Parts Dexterity Test and The Stromberg Dexterity Test are useful devices for the purpose.

The Differential Aptitude Test Battery is a famous aptitude test. It was produced in 1947 as a guidance battery by Psychological Corporation of the U.S.A. It is constituted of eight sub-tests, which are

1. *Verbal Reasoning*. It contains items of double analogies type. Two sets of answer choices are provided and one must be picked from each set to complete the analogy.

2. *Numerical Ability*. It consists of numerical problems emphasizing comprehension rather than simple computational ability.

3. *Abstract Reasoning*. A series of problem figures establishes a relationship or sequence, and the examinee has to pick the choice that continues the series.

4. *Space Relations*. A flat figure is shown. The examinee has to visualize and indicate which solid figure or figures could be produced by foldidg the flat figure.

5. *Mechanical Reasoning*. A diagram of a mechanical device is shown and the examinee has to indicate which choice is true of the situation.

6. *Clerical Speed and Accuracy*. An item is made up of a number of combinations of symbols. The examinee has to mark the same combination on his answer sheet.

7. *Language Usage*. From a list of words, the examinee has to indicate whether each word is correctly or incorrectly spelt.

8. *Sentences*. A sentence containing errors is divided into subsections and the examinee indicates all the sections that contain an error.

In respect of these tests percentile norms for grades 8 – 12 have been worked out.

Aptitude tests may be used to divide students into relatively homogeneous groups for instructional purposes, to identify students for scholarship grants, to screen individuals for particular educational programmes or help guide individuals into areas where they are most likely to succeed.

But their use is criticized on the ground that most of these tests do not accurately predict academic achievement since their contents are culturally biased. Efforts are however being made to develop culture-free tests that eliminiate this undesirable characteristic.

INTEREST INVENTORIES

Interest inventories attempt to yield a measure of the types of activities that an individual has a tendency to like and to choose. Interest, however, is not as consistent as aptitude. It is related to general intelligence and special aptitudes and is determined in part by social environment of an individual and his opportunities to experience different kinds of activities. Interests are a significant element in the personality pattern of individuals and play an important role in their educational and professional careers. The tools used for describing and measuring interests of individuals are the interest inventories or interest blanks. They are self-report instruments in which the individuals note their own likes and dislikes. They are of the nature of standardized interviews in which the subject gives an introspective report of his feelings about certain situations and phenomena which is then interpreted in terms of interests.

The use of interest inventories is quite essential in the areas of educational and vocational guidance and case studies. Distinctive patterns of interest that go with success have been discovered through research in a number of educational and vocational fields. Artistic, literary, scientific, computational, musical, clerical and many other areas of interest have been analysed in terms of activities. A person's stated likes and dislikes in terms of specific activities are sorted into various interest areas and percentile norms are calculated for each area. The areas in which a person's percentile ranks are relatively higher are considered to be the areas of his interests, the areas in which he would be the happiest and the most successful. During educational surveys, we can study the student's interest in games, reading, co-curricular activities, etc. through these interest inventories.

One kind of instrument, most commonly used in interest measurement is known as *Strong's Vocational Interest Inventory*. It compares the subject's pattern of interest to the interest patterns of successful individuals in a number of vocational fields. This inventory consists of 400 different items. The subject has to tick mark one of the alternatives i.e. L (for like), I (for indifference) or D (for dislike) provided against each item. When the inventory is standardised, the scoring keys and percentile norms are prepared on the basis of the responses of a fairly large number of successful individuals of a particular vocation. A separate scoring key is therefore prepared for each separate vocation or subject area. The subject's responses are scored with the scoring key of a particular vocation in order to know his interest or lack of interest in the vocation concerned. Similarly his responses can be scored with scoring keys standardised for other vocational areas. In this way we can determine his area/areas of vocational interests.

Another well-known interest inventory is *Kuder's Preference Record.*

PERSONALITY MEASURES

Personality scales are usually self-report instruments. The individual checks against certain statements or questions. These instruments yield scores which have been shown to measure certain personality traits or tendencies. Personality testing, however, is yet in its formative years and more research is required towards constructing and improving such tools. Some instruments have reasonable empirical validity with particular groups of individuals, but prove to be invalid when applied to others. For example, one personality inventory has proved valuable in yielding scores that correlate highly with the diagnoses of psychiatrists in clinical situations. But when applied to college students, its diagnostic value has proved disappointing.

Personality measures are mainly of two kinds : (*i*) *direct or inventories* and (*ii*) *indirect or projective techniques*. They are like interest inventories requiring self-report of the subjects on their personality patterns. Possessing many of the characteristics of inquiry forms like questionnaire and rating-scale they can be considered tests only to the extent that they are carefully standardized and yield quantitative measures. An inventory which has often been used as research device to identify and describe certain personality traits among students is the *Mooney Problem Check List*. It is an inventory in two forms to be used by students in reporting their own problems of adjustment. Their responses yield not only a verbal picture of individual's adjustment problems but also quantitative scores—category-wise as well as total—which indicate the degree of difficulty he feels he is experiencing in his adjustment.

The validity of these direct personality measures called inventories, however, is limited. The individuals have a tendency to withhold embarrassing responses and express only those that are socially acceptable. They are unable to report their own reactions accurately or objectively. They have lack of insight into their own selves and are emotionally involved with their own problems.

Somewhat free from limitations of personality inventories are the projective tests of personality which disguise their purpose so completely that the individual unconsciously projects his personality through his responses to given situations. *Rorschach's ink-blot test*, *T.A T.*, *C.A T.*, *Rosenzeweig's Picture Frustration Study*, are all projective techniques, where, in reaction to vague visual pictures or symbols, individuals project their own personalities. *Tautophone* and *Word-Association Tests* present various sounds and words respectively as stimuli for the purpose of recording reactions which are later interpreted according to a set scheme of interpretation. *Sentence completion*, *story-completion*, *argument-completion*, etc. are other similar devices which depend a good deal on subjective judgement and skill of interpretation. These techniques, however, present problems of more or less developmental and promotional try-out. The individual has to organise a series of unstructured situations, or objects in some way. Obviously there is no one 'right' set of responses. The investigator interprets the pattern of individual's responses according to valid and reliable categories that have been developed for the test.

The techniques of role-playing, creative or constructive work and even observation have also been used for personality assessment. The use of projective devices is particularly helpful in counteracting the tendency of subjects to try to appear in their best light.

ELEVEN

The Questionnaire

A questionnaire is a form prepared and distributed to secure responses to certain questions. It is a device for securing answers to questions by using a form which the respondent fills by himself. It is a systematic compilation of questions that are submitted to a sampling of population from which information is desired. It is that form of inquiry which contains a systamatically compiled and organised series of questions that are to be sent to the population samples. It is an important instrument in normative-survey research, being used to gather information from widely scattered sources. The questionnaire procedure normally comes into use where one cannot readily see personally all of the people from whom he desires responses or where there is no particular reason to see them personally.

The questionnaire is probably the most used and the most abused of the data-gathering devices. It has been referred to as the lazy man's way of gaining information. The apparent ease of preparing and using a questionnarie tends to make it appealing to the beginners in research. No doubt it is the most flexible of tools in collecting both quantitative and qualitative information. But the poorly constructed questionnaires that flood the mails have created a certain amount of contempt. The questionnaires prepared by the fresh research workers suffer from certain errors with the result that the reaction to questionnaires is often unfavourable and response is slow, scanty and frequently disappointing, providing a very flimsy basis for generalization.

Filling out a lengthy questionnaire takes a great deal of time and effort, a favour that few research workers have any right to expect of the strangers. The unfavourable reaction is intensified when the questionnaire is long, the subject trivial in importance, the items vaguely worded and the form poorly organized. There are many reasons why so small a proportion of questionnaires sent out by mail are returned. As a result of this sparse response, the data that are obtained are often of limited validity. The questionnaire quite often fails to cover very busy and preoccupied persons among respondents, lazy and indifferent type of persons, the undesirable type of respondents who need to conceal a lot about themselves, the easy-going and shirkers among the subjects, the persons who have an unreasonable contempt for research and reform, and the persons, who unnecessarily doubt the research worker's intentions, sincerity, devotion and commitment. These are the people who are a very important segment of the respondents to be covered in any data cellection but they can be seldom caught. They are determined not to fall into your trap. They can get away or escape with this or that excuse.

The foregoing discussion may have seemed to discredit the questionnarie as a respectable research teachnique, but we cannot forget that it has some unique advantages. A properly constructed and administered questionnarie may serve as a most appropriate and useful data-gathering device.

Scope of Questionnaire

Its scope has been very vast. It has been used for studying a wide range of problems. To cite a few cases we can say that it has been used for studying the problems of teacher training, service conditions and financial conditions of teachers, administrative difficulties, suitability or otherwise of the curriculum, methods of teaching, study habits, testing of achievement, duties and difficulties of teachers, rating of school text-books, etc. They may also be helpful in the fields of attitudes, opinions and judgments.

Various forms of Questionnaire

It is useful to know the various forms in which questions can be prepared and asked.

Structured vs Non-Structured. The structured contains definite, concrete and directed questions, whereas non-structured may consist of partially completed questions or statements. A non-structured questionnaire is often used as the interview guide, which is non-directive. The interviewer possesses only a blueprint of the enquiries and he is largely free to arrange the form or statements of the questions. The enquiries framed in a general form before-hand are given a specific form during the actual process of interview.

Closed form vs open form. The questions that call for short check responses are known as restricted or closed form type. They provide for marking a yes or no, a short response, or checking an item out of a list of given responses. It restricts the choice of response for the respondent. He has simply to select a response out of supplied responses and has not to frame his response in his own way.

It is easy to fill out, takes less time, keeps the respondent on the subject, is relatively more objective, more acceptable and convenient to the respondent, and is fairly easy to tabulate and analyse.

The open form, open end or unrestricted type questionnaire calls for a free response in the respondent's own words. The respondent frames and supplies his own response. No clues are provided. It probably provides for greater depth of response. The subject reveals his mind, gives his frame of reference and possibly the reasons for his responses. This type of item is sometimes difficult to interpret, tabulate and summarize in the research report. When the respondent is allowed freedom of response his expression may take any unique direction which may not find any uniformity with other responses.

Many questionnaires include both open and closed type items. Each type has its specific merits and limitations and the research worker has to decide which type is more likely to supply the information he wants.

Fact and Opinion Questionnaires. George A. Lindberg classified questionnaires as (1) Questionnaire of fact, which requires certain information of facts from the respondent without any reference to his opinion or attitude about them, and (2) Questionnaire of opinion and attitude in which the informant's opinion, attitude or preference regarding some phenomena is sought.

CHARACTERISTICS OF A GOOD QUESTIONNAIRE

1. It deals with an important or significant topic so that it enthuses respondent to give response. Its significance is carefully stated on the questionnaire itself or on its covering letter.

2. It seeks only that data which cannot be obtained from the resources like books, reports and records.

3. It is as short as possible, only long enough to get the essential data. Long questionnaires are frequently thrown away into the waste-paper-basket.

4. It is at the same time as much comprehensive as necessary so that it does not leave out any relevant and crucial information.

5. It is attractive in appearance, neatly arranged and clearly duplicated or printed.

6. Directions are clear and complete, important terms are clarified, each question deals with a single idea, and is worded in as simple and clear manner as possible and provides an opportunity for easy, accurate unambiguous response.

7. The questions are objective, with no clues, hints or suggestions as to the responses desired. Leading questions are carefully avoided.

8. Questions are presented in good psychological order proceeding from general to more specific responses. This order helps the respondent to organize his own thinking so that his answers are logical and objective. The opening questions create a favourable attitude before any

progress is made towards the questions which are a bit delicate or intimate. The offending, annoying or embarrassing questions have to be avoided as far as possible.

9. Items are arranged in categories to ensure easy and accurate responses and to help the respondent to do better justice to one category at a time.

10. Descriptive adjectives and adverbs that have no agreed upon meanings are avoided, *e.g.* words like frequently, occasionally, rarely, etc.

11. Double negatives are also avoided, *e.g.* Don't you disapprove of forced discipline ?

12. Double barreled questions or putting two questions in one question are also avoided *e.g.* What is your main subject ? Do you teach any other subject also apart from that ?

13. The questions carry adequate number of alternatives, *e.g.* if we ask—Are you married ? and provide only the alternatives of yes/no, then these are inadequate number of alternatives.

14. It is easy to tabulate, summarize and interpret. It is advisable to preconstruct a tabulation sheet, anticipating how the data will be tabulated and interpreted, before the final form of the questions is decided upon. This working backward from a visualization of the final analysis of data is an important step in avoiding ambiguity in the questionnaire.

15. If mechincal tabulating equipment is to be used, it is important to allow code numbers for all possible responses to permit easy transference to machine-tabulation cards.

PREPARING AND ADMINISTERING THE QUESTIONNAIRE

The investigator cannot get a readymade questionnaire appropriate for his study. He has to prepare it for himself. He should frame almost one and a half times more items than needed after adequate consultation and trial. He should keep in mind the following steps and suggestions :

1. He should secure all the help he can in planning and constructing his questionnaire—study other questionnaries and submit his items for criticism to other members of his class or his faculty especially to those who possess the experience of questionnaire construction.

2. The researcher should not suffer from this assumption that he knows how to ask questions. But asking questions that will obtain the precise, reliable data is no easy task. He is often amazed when respondents draw many different meanings from questions that he thought were perfectly clear.

3. He should thoroughly explore his hypotheses, experiences, the

literature and other questionnaires so as to frame questions that probe the crucial issues in depth.

4. He should attain a thorough grasp of the field and a clear understanding of the objectives of the study and of the nature of the data needed.

5. Various means are available for discovering items to be incorporated into a questionnaire and to test it for completeness. There is an ample literature available on the preparation and use of the questionnaire. Koos' book, report of National Education Association, book by Goodenough and Anderson, book by Symonds and by Bixler are very good references having an important bearing on questionnaire construction.

6. Constructing a questionnaire calls for numerous revisions in which variations of the same question should be submitted to experimental trial. The same question posed in different ways very frequently brings out different responses. The help of outsiders is essential; they are generally more objective and can see flaws that the investigator is too close to see. This points to the need for an actual pilot study. The rough questionnaire may be given a trial on a few friends and acquaintances who are reasonably competent to fill it out. This trial will reveal gaps and defects that can be corrected in time.

7. Professional people are aware of their responsibility to provide information, which they feel is for a good cause. The questionnaire studies have to compete with many other demands on the respondent's time and goodwill. If the research worker is to expect the respondent to spare his time and energy, it is obligatory on him to prepare a questionnaire in the most scholarly fashion.

8. A primary consideration in questionnaire construction is the content of the questions which should elicit valid and realiable answers. Each question must be justified on the basis of its contribution to the overall purpose of the study.

9. Questions must be worded so that they are important and meaningful to the person to whom they are addressed. Each question must be absolutely clear not only to the maker but also to the receiver.

10. One should seek responses of such type that they can be summarized in some form. The step of summarization should be considered as and when questions are being framed. He should try tabulating or summarizing the data received from a preliminary trial. It will result into allround improvement of the research tool as well as the entire research procedure.

11. If the questionnaire is planned for use in a particular school system it is essential that approval of the project be secured from the concerned officers, authorities or management. If the authorities refuse

to extend necessary cooperation to the research worker, his progress is blocked. School officials may also want to prevent the dislocation in the normal functioning of the school for the sake of data collection. They may also not like the time of the teachers and pupils being wasted by amateur research workers.

12. If the desired information is delicate or confidential in nature, he should provide for anonymous response. Even if the respondent is required to disclose his identity, it is essential to convince him that his responses will be held in strict confidence and that the data will be used for no purpose other than research.

13. The research worker should try to secure sponsorship. Respondents are more likely to answer if the project enjoys the sponsorship of some known educationist, a reputable organisation or a prestigeous institution. When the investigator is working for or under some known authority, the respondents try to oblige.

14. The respondents have to be chosen carefully. The questionnaire should be sent only to those who possess the desired information and those who are likely to be sufficiently interested to respond. A priliminary card, asking whether or not the individual would be willing to participate in the proposed study is recommended by some research authorities.

15. The directions and questions should be so worded and ordered as to allay any fears, suspicions, hesitations, embarrassment or hostility on the part of the respondent.

16. Some specific questions may be asked in order to check the truthfulness of answers to general questions. Some parallel questions may also be asked in order to check consistency of answers.

17. The items should be placed in a psychologically or logically sound sequence—simple, interesting, neutral questions preceding more difficult, crucial or personal ones. The opening questions should establish a frame of reference or provide keys to recall. The details may be asked later on.

18. He should include a courteous, carefully constructed covering letter to explain the purpose and importance of the study. Of course a self addressed stamped envelope for reply is obligatory. It is suggested that two copies of a questionnaire may be sent, one to be returned when completed and the other for the respondent's own record.

19. The respondents are often slow to return completed questionnaires. To increase the number of returns, a vigorous follow-up procedure may be necessary. In some cases a reminder/reminders may suffice but in extreme cases a telegram, phone call or personal visit may bring additional responses.

20. The validation of a questionnaire utilizes the same principles and procedures as the validation of any instrument of tests and measure-

ments. At the most elementary level, it is necessary for the questionnaire to have face validity, that is, each question must be related to the topic under investigation, there must be an adequate coverage of the overall topic, and so on. A more adequate validation, however, requires checking the responses against an external criterion. A possible solution is to follow the questionnaire with an interview of a sample of the respondents to see whether their responses to the questionnaire actually represent their views on the subjects discussed.

In some instances, it is possible to validate questionnaire responses against actual behaviour. Establishing validity is even more complicated in open questionnaires where the interpretation of the responses constitutes an added source of unreliability and invalidity.

The validlty of a questionnaire must be established prior to its use, for validation is an aspect of its development, not of its use in the solution of the problem. Apart from the instrument itself, the invalidity can also result from systematic errors in coding or in interpretation or from the biased orientation of the covering letter or the directions.

21. It is difficult to estimate as to what percentage of responses can be considered adequate for an investigation. The importance of the project, the quality of the questionnaire, the nature of the project, the nature of the group of respondents selected, the time of the year and many other factors determine the proportion of responses, that could be considered adequate.

Analysis and Interpretation of Questionnaire Responses

Quantification of data obtained is generally achieved through tabulation and counting. Presentation of results in tabular form, in totals, percentages or averages is invariably required. The data are expressed quantitatively on the basis of the number of persons whose replies are tabulated under the several categories of the questions.

Frequency tables or distributions may be formulated on the basis of frequencies of short answers—*i.e.* on the basis of the number of persons whose replies come under the same or similar category.

Numerical answer to the same question by different respondents can be added and averaged, *i.e.* years of experience, hours of work, number of periods per day, number of absentees, number of late comers, etc. But answers to one question can seldom be combined with the answers to another question. Comparisons can however be made from question to question.

Narrative data is often hard to analyse. Such responses have to be first converted into brief notes and then cumulated under various categories. This process needs considerable judgement and is often tedious.

Calculation of coefficients of correlation is often made in order to suggest the relationship among data.

The interpretation of the data analysed and the formulation of conclusions should take into consideration the percentage of responses secured, as the smaller the percentage of responses, the lesser the reliability of the data collected. The report of the investigation should invariably mention this percentage.

ADVANTAGES

1. As an instrument of science, the questionnaire has great potentialities when it is properly used. If it is eliminated, progress in many areas of education would be greatly handicapped.

2. It is an economical way of accumulating information of significance to educators. It is economical both for the sender and for the respondent in time, effort and cost.

3. When the subjects of the study are scattered far and wide, it will be a better tool as compared to the tools like interview or observation. It permits a nation wide or even international coverage. It makes possible contact with many who could not otherwise be reached.

4. It permits group administration and is adaptable to any objectives. It can cover a large group at the same time.

5. It is easy to plan, construct and administer.

6. Once it has been constructed skilfully, the investigator may ask anybody to administer it on his behalf.

7. It is generally regarded as dependable when used to obtain statements of fact.

8. Information of a personal nature often may be obtained more readily by means of questionnaires, especially if the respondent is permitted to omit signatures or if specifically assured that his replies will be regarded as confidential.

9. It places less pressure on the subject for immediate response. He can answer it at leisure, whereas interview/observation demands specific fixation of time and situation.

10. It helps in focussing the respondent's attention on all the significant items. As it is administered in a written form, its standardized instructions for recording responses ensure some uniformity. Quetionnaire does not permit much of variation.

11. It may be used as a preliminary tool for conducting a depth study later on by any other method.

12. In this method, the responses given by the subjects are available in their own language and version, whereas in tools like interview or observation, responses depend on the way the investigator has recorded them. The written record adds to the validity of responses.

LIMITATIONS

1. Its reliability and validity is low. Its frequent use is a vice and a weakness instigating against the recognition of educational research as a science. It is the voice of expediency, not of science. It seeks secondary information, hearsay evidence concerning facts when primary evidence is at hand

2. Frequently questionnaire research constitutes simply a pooling of ignorance. It is compilation of the opinions of many persons who do not know the answer.

3. It gives a biased sample. The matter of non-response is always a big question mark.

4. The respondents who return the questionnaires may not constitute a representative section of the entire group. Only more responsible, research minded or those in favour of the issue may choose to respond. Some of the important sections of the group may totally choose to remain silent. This vitiates the final conclusions and findings.

5. If the subject misinterprets a question or gives an incomplete or indefinite response, nothing can be done. As against this, in an interview, there is always the possibility of rephrasing questions for further clarification. The questions can be repeated with adequate elaboration, if need be.

6. Since a questionnaire is more or less rigid in its structure, it is not very helpful in finding information about complex emotional subjects, or about sentiments which people may not like to put into black and white. It is only through interview that the investigator can discuss delicate and controversial issues and can dig out the subject's feelings.

7. Some respondents may not like to put their views on controversial issues in writing. Such views can be drawn out only through interviews.

8. The behaviours, gestures, reactions, emphases, assertions and emotions of the respondent remain unnoticed.

9. There are many people who would not like to share any important information unless and until they are impressed about the cause and the personality of the investigator. The questionnaire does not provide for any opportunity to the investigator to establish rapport with the subject.

10. Some of the research-areas are so delicate, sensitive, intricate and confindential in nature that it becomes difficult to frame questions on them. It is impossible to put down certain delicate issues in writing.

11. It permits the respondent to modify his answers to earlier questions when he finds that he is contradicting himself while answering some later questions. Thus his responses may not remain true, factual, honest and original.

12. The questionnaire cannot be used with illiterate subjects and children.

Still the general consensus goes in favour of the use of questionnaire. It can undoubtedly serve a very useful and definite purpose in the advancement of education at its present stage of development—and perhaps for some time to come. It is clear, however, that there is an urgent need for the improvement of its quality and for the restriction of its use to only those situations for which it is suited.

TWELVE

Documentary-Frequency Studies

This type of normative-survey research, like historical research, deals with records which already exist. But it is definitely quantitative. It is not concerned with the general importance of the documents, but with certain characteristics which can be identified and counted.

The fact that one works directly from documents does not mean that he avoids all problems of collecting and selecting data. In some cases he may need only to procure a few books from a library, but in other cases he may need to collect his documentary specimens from afar, and he may have to select only certain aspects of these specimens for his study.

In documentary analysis, the following may be used as sources of data : records, reports, printed forms, letters, autobiographies, bulletins, catalogues, syllabi, court decisions, pictures, films, cartoons, etc.

When using documentary sources, one must bear in mind the fact that data appearing in print are not necessarily trustworthy. Documents used in this research must be subjected to the same careful types of criticism employed by the historian. Not only is the authenticity of the document important, but the validity of its contents is also crucial.

Purposes of Documentary Studies

1. To describe prevailing practices or conditions, *e.g.* finding the entrance requirements of any professional course.

2. To discover the relative importance of, or interest in certain topics or problems, e.g. determining statistical concepts presented in college textbooks in educational research.

3. To discover level of difficulty of presentation in textbooks or in other publications, e.g. the vocabulary level of college stage science textbooks.

4. To evaluate bias, prejudice, or propaganda in textbook

presentation, e.g. racial and religions stereotypes in high school literature textbooks.

5. To analyze types of errors in students' work, e.g. errors in English usage in letters of application for admission to a particular course.

6. To analyse the use of symbols representing persons, political parties or institutions, countries, or points of view, e.g. national integration as a symbol as represented in language text books.

7. To identify the literary style, concepts or beliefs of a writer, e.g. Gandhi's interpretation of education as life.

8. To explain the possible causal factors related to some outcome, action or event, e.g. the influence of newspaper editorials on the development of education.

Textbook Analysis

Among the simpler examples of documentary frequency studies may be mentioned textbook analysis. It is a favourite topic of research. A research worker may choose any set of objective characteristics which he thinks are significant in a book and note the extent to which they occur. He may count the number of difficult words, the number of illustrations, the number of tables, the number of errors, the number of misstatements, the types of explanation, the number of exercises, the number of topics, the number of pages devoted to each topic, etc. Other investigations may be concerned somewhat more broadly with the kind of content, perhaps in relation to the objectives of that subject. Some studies deal with the grade placement or general difficulty of the material.

Vocabulary analysis

An investigator might undertake to determine the common vocabulary of children through an analysis of their letters, and other writings. Among the classic studies in this category is the pioneer vocabulary study made by Thorndike in which he identified the 10000, 20000 and 30000 most used words. Frequency lists of the most common words in use in a foreign language have also been prepared. The words which are regarded as technical or peculiar to a particular school subject have been studied and compiled in the case of all the subjects. These studies have been based partly on printed literature and partly on collected specimens. They have typically included the gathering of children's compositions, social letters, and other examples of child or adult usage of words in everyday situations.

Curriculum analysis

Documentary-frequency studies can be particularly valuable in curriculum revision. The underlying theory states that since not everything known can be taught in school, the things which are socially most useful should be selected and taught. These can be discovered by an appropriate interpretation of frequency analysis of social activities and interests.

Error Studies

These investigations are concerned, not with the frequency of use, but with the frequency of errors made in usage. These have been devoted chiefly to language in its various phases, since errors in language normally constitute the bulk of the errors which are made in informal written material. Spellings, arithmetic, geography, punctuation, grammar, speech, and sentence structure are among the many fields subjected to such analysis. The errors made by teachers have also been studied in several cases.

Characteristicts of reports

This is another area of documentary studies. Records and reports constitute a phase of administration and also instruction. This analysis involves noting certain characteristic of the forms and then counting the number of school systems that have this characteristic in their set of records or reports. Some workers have studied pupil-record forms in respect of the frequency of each item, and the frequency with which each item of information is actually made use of. Others have studied the Superintendent's report, as to its mechanical make-up and as to its effectiveness in giving information and in properly publicizing the schools. A number of studies have been concerned with the records of city school systems and state school systems. Other analyses have been devoted to the report cards, teachers' class registers, annual reports, school magazines, financial reports, etc.

Job analysis

Charters has applied Documentary analysis for the purpose of job analysis and 'activity analysis'. For determining the duties and traits of a teacher, for example, the investigator may go through the literature on teacher and teaching. This will enable him to find out the frequencies with which different attributes are associated with the teacher and teaching.

INTERPRETING FREQUENCY STUDIES

The interpretation of frequency analyses based on existing materials is in many respects similar to the interpretation of questionnaire returns. Frequency is an element in importance, but it is only one element and its significance must be evaluated by carefully analyzing its logical contribution to the total picture.

The data must be selected and gathered for a purpose, and they must contain those factors which, when analyzed, will throw light on that purpose. There is little use in gathering data which cannot be interpreted, or which, when legitimately interpreted, have no bearing upon one's problem.

The chief technical problem of frequency studies is the formation of appropriate categories in which frequencies may be secured. The difficulty lies in determining suitable divisions among the larger or more general characteristics of various units. The problem is then, for example, what kinds of pages, lines, errors, etc. shall be counted, and what groups shall be kept separate among them.

The formation of appropriate categories involves a process of noting similarities and differences, delimiting concepts, and fitting them into an integrating scheme. Three of the criteria for good categorization can be : purpose, differentiation and homogeneity. The purpose of the research study must be satisfied by the categories which are established. Differentiation relates to the distinction between the categories, they should not overlap and the basis of differentiation should be clear and reasonably consistent. According to homogeneity, all the cases which fall within any single category should be statisfactorily similar.

LIMITATIONS OF DOCUMENTARY STUDIES

1. There is need for caution at the stage of interpretation. These studies, for example, can provide valuable information to be considered in the revision of the curriculum, but it must not be assumed that frequeucy of occurrence of a given phenomenon is synonymous with its importance. The fact that adults make little use of the fractions of the variety of 7/19 implies that these should be eliminated from the curriculum. Research should not be expected to provide decisions, but simply data on which intelligent decisions can be based.

2. There is tediousness involved in this method. Thorndike's 10,000 most used words, for example, were selected from over 7,000,000 words found from forty-one different sources.

THIRTEEN

Interview

Some people refer to the interview as an oral questionnaire but it is indeed much more than that. Questionnaire involves indirect data collection, whereas in interview the investigator gathers data directly from others in face-to-face contact. Interview is generally adopted as a method to offset the limitations of the questionnaire. Instead of writing the response, the subject or interviewee gives the needed information verbally in a face-to-face relationship. People are usually more willing to talk than to write. With a skilful interviewer, the interview is often superier to other data-gathering devices. After the interviewer gains rapport, or establishes a friendly relationship with the subject, certain types of confidential information may be obtained that an individual might be reluctant to put in writing.

Interview is a two-way method which permits an exchange of ideas and information. It is unique in that it involves the collection of data through direct verbal interaction between the interviewee and the interviewer. It requires the actual physical proximity of two or more persons and generally requires that all the normal channels of communication be open to them. As a research technique, the interview is a conversation carried out with the definite purpose of obtaining certain information by means for the spoken word.

The interviewer can explain the purpose of his investigation, and can explain more clearly just what information he wants. If the subject misinterprets the question, the interviewer may follow it with a clarifying question. At the same time, he may evaluate the sincerity and insight of the interviewee. It is also possible to seek the same information in several ways, thus providing a check for the truthfulness of the responses.

IMPORTANCE OF INTERVIEW

1. The interviewer can probe into causal factors, determine attitudes, discover the origin of the problem, involve the interviewee in an analysis of his own problems and secure his cooperation in this analysis.

2. It is particularly appropriate when dealing with young children, illiterates, those with language difficulty and those with limited intelligence.

3. Perhaps no research technique is as close to the teacher's vital problems as the interview.

4. This techinque is in fact indispensable in diagnosis.

5. The respondents need the stimulation of personal contacts to be drawn out and some of them may be too ignorant to read and write.

6. It permits the investigator to follow up leads and take advantage of small clues in complex material where the development is likely to proceed in any direction.

7. It can also make cross questioning possible.

8. It helps the investigator to gain an impression of the person concerned.

9. It also affords an opportunity for the interviewer to give information and to develop certain attitudes on the part of the respondent. Such an opportunity is important in the treatment interviews.

10. It is superior to many other tools because of its flexibility. Many on the spot improvements, explanations, adjustments or variations can be introduced in the data-gathering process.

11. People are usually more willing and less hesitant to talk than to write especially on delicate, intimate and confidential topics.

12. It is especially appropriate when dealing with abnormal persons, etc.

13. Through the respondent's incidental comments, facial and bodily expressions, tone of voice, gestures, reactions, feelings, attitudes, evasiveness and non-cooperation, an interviewer can acquire information that would not be conveyed in any other way.

14. The sincerity, frankness, truthfulness and insight of the interviewee can be better judged through cross-questioning.

15. There is no chance for the respondent to rectify, modify and edit his earlier answers in the light of later questions.

16. Some times interviews can be repeated at intervals to trace the development of behaviour, attitudes or situations.

17. While the questionnaire is out of the hands of the investigator the minute it is mailed, the interview allows the investigator to remain in command of the situation throughout the investigation.

18. The flexibility of the interview is of greatest value in exploratory studies where the field needs to be structured as the investigation proceeds.

19. It generally ensures a higher percentage of the coverage of the proposed subjects. The percentage of the defaulters will be minimised.

20. It permits the establishment of greater rapport if the situation so demands. It has motivating and stimulating quality about it. It stimulates the respondent to give more complete and valid responses. It permits the interviewer to help the respondent clarify his thinking on a given point so that he will give a response where he would normally plead ignorance. If a respondent indicates that he cannot remember, the skilful interviewer may structure the field for him pointing out some concurrent events in order to refresh his memory.

21. Often the interview is used for practical purposes rather than for research purposes. For example, it is used for student counselling, occupational adjustment, psychiatric work, commercial or social surveys, selection of candidates for education or employment, legal proceedings, enquiries, etc.

22. It is one of the normative-survey methods, but it is also applicable in historical, experimental, case and clinical studies.

CLASSIFICATIONS OF INTERVIEW

Interviews vary in purpose, nature and scope. They may be conducted for guidance, therapeutic or research purposes. They may be confined to one individual or extended to several people who are closely associated with him as in a case study. To solve some problems, a number of people with similar or different backgrounds are questioned once briefly or several times intensively. The following discussion describes several types of interviews.

Individual and Group Interviews

Most interviews are conducted in a private setting with one person at a time so that the subject will feel free to express himself fully and truthfully. When qualified or competent individuals with common or divergent backgrounds are brought together in a group to explore a problem, they can present a wide range of information and varied viewpoints. They can also help one another recall, verify or rectify items of information. Subjects may refrain from expressing some points before a group, however, that they might reveal in a private interview. Moreover, one person (and not necessarily the best-informed one) may dominate the discussion so that the viewpoints of other participants are not explored thoroughly.

Single and Panel of Interviewers

Apart from the number of persons participating in the interview as interviwees may be one and many, there may be variation in the number of interviewers also. It may be held by one interviewer or by a panel of interviewers. If the field to be covered is very vast & varied it may necessitate that the subjects are interviewed by a panel. This panel may consist of various experts in the areas to be covered. The members of the panel can distribute and allocate various functions among themselves. For example if a renowned teacher is to be interviewed to judge his qualities and contributions, it may not be possible for a single interviewer to do justice to the job. A panel may have to be constituted consisting of subject expert, administrator, parent, old student, psychologist, social worker, etc.

Structured and Unstructured Interviews

These two types are based on the nature of preparation for the interview and its actual execution. Some interviews are rigidly standardized and formal ; the same questions are presented in the same manner and order to each subject and the choice of alternative answers is restricted to a predetermined list. These structured interviews are more scientific in nature than unstructured ones, for they introduce the controls that are required to permit the formulation of scientific generalizations. But they also have certain limitations, because they have necessity of collecting quantified, comparable data from all subjects in a uniform manner which introduces a rigidity into the investigation that may make it impossible to probe in sufficient depth.

Unstructured interviews are flexible ; few restrictions are placed on respondent's answers. Even if preplanned questions are asked ; the queries are altered to suit the situation and subjects. Sometimes subjects are encouraged to express themselves freely and only a few questions are asked to direct the trend of the interview. In some cases, the information is obtained in such a casual manner that the respondents are not even aware that they are being interviewed.

In an informal unstructured interview, one can penetrate behind initial answers, follow up unexpected clues, & redirect the inquiry on the basis of emerging data into more fruitful channels.

A researcher must be familiar with both structured and unstructured interview techniques, because he is likely to employ both types during an investigation. Many of the rules that apply to the formation of questionnaires also apply to structured interviews and the use of unstructured interview depends largely on the alertness, resourcefulness and ingenuity of the investigator.

Non-directive and focused interviews

A non-directive depth interview or unguided interview, which is almost psychoanalytical in character, is sometimes the most appropriate method for obtaining insights into hidden or underlying motivations ; unacknowledged attitudes, personal hopes, fears, conflicts and the dynamic interrelatedness of responses. Here the investigator permits the subject to talk freely. While he unfolds his story, the interviewer serves as a good listener humming an approval here or there or putting a generalized question to stimulate the flow of conversation. When the interview is drawing to a close, he may ask some direct questions to fill in the gaps. By placing few restrictions on the direction of the discussion, the investigator gets a natural and representative picture of the subject's behavior and gains an insight into the nature and intensity of his attitudes, motives, feelings and beliefs.

A focused interview is less diffused than a depth interview. It focuses attention upon a concrete experience. For example, if the subject has read a book, an effort is made to ascertain the specific effects that this experience has had upon him. To probe the attitudes and responses of the subject the interviewer thoroughly analyzes the book prior to meeting him, prepares appropriate questions to serve as a framework for the discussion, and during the interview, confines the conversation to these relevant issues. The respondent is permitted to express himself completely, but the interviewer directs the line of thought.

The Depth Interview. It is an intensive and searching type of interview with emphasis on such psychological and social factors as attitudes, emotions or convictions. It determines the respondent's degree of detachment, attachment and involvement with an experience or activity. It usually involves flexibility of interview situation, focus on feelings and a restatement of implied or expressed feelings.

Diagnostic Interview. It is used frequently in clinics as well as by social workers. It proposes to locate the possible causes of an individual's problems through getting information about his past history, family relations and adjustment problems, etc.

Clinical Interview. Following the screening or diagnostic interview, clinical interview takes place as a means of introducing the patient to therapy. It may take the form of guiding friends and relatives (in addition to the patient himself) in their dealings with the patient or of an exit or termination interview before the patient is discharged from the clinic.

Research Interview. These three divisions of interview viz. Diagnostic, Clinical and Research are based upon the function of interview. In research, interview may be used as a tool for gathering data required by the investigator to test his hypothesis or to solve his problems of historical, experimental or clinical nature.

Standarized and unstandardized Interview. Standardized interview resembles the more purposeful questionnaire rather closely and is more reliable whereas unstandardized interview is capable of deeper probing and is more flexible and life-like.

Semi-structured Interview. The interview can be regarded as a set questionnaire personally and verbally given. In this case it is regarded as completely structured. In this semi-structured interview the general outline to be followed is indicated but within each section the questioning is free and full according to the choice of the interview.

Free Interview. It is generally similar to unstructured type. It is geared to certain large objectives and some procedural design in the mind of the interviewer but is otherwise untrammelled.

Some other classifications. There are some other classifications of interview also :

1. *Intake interview.* It is the initial stage in clinics and guidance centres.

2. *Brief talk contacts.* They are generally used in schools and recreation centres.

3. *Clinical interviews.* These stress psychotherapeutic counselling and utilise case history data and active participation by the counsellor in the re-education of the client.

4. *Psychiatric interviews.* These are similar to psychological counselling but vary with the personality and philosophical orientation of the individual worker and with the setting in which used.

5. *Psychoanalytic interviews.* These are the interviews especially employed by a psychoanalyst to dig deep into the causes of abnormalities.

6. *The test interviews.* These are the viva-voce tests in vogue in various courses and accomplishments.

NON-RESEARCH INTERVIEWS

There are various interview situations with which we are familiar. They are meant for various purposes other than research. It will be of use for us to know something more about them and their nature which is markedly different from an interview for research.

Employment Interviews. Most people who are now employed participated in an interview when they were being considered for their jobs. In an employment interview certain facts concerning the individual's training and experience are usually sought, although these could very well be gathered on application blanks. The principal purpose of the face-to-face contact is to afford the employer an opportunity to observe the reactions of the respondent, to judge the quality of his mental reactions and the social aspects of his behaviour. Employment interviews do not themselves constitute research, but they may be made the object of research.

Interviews in Education. Interview is not only important for research purposes, it can be used directly by the teachers in connection with their everyday classroom problems. It is an everyday experience with a teacher or educational administrator. It is indispensable in diagnosing causes and reasons for various difficulties and problems. It is also useful in studying the more general habits of work and usually reveals conditions that cannot be dreamed of under ordinary circumstances.

It is a regular device in child guidance and counselling. It may be adopted by teachers to help the less acute cases of mental problems. It is prominent in case study and psychiatric work. School workers other than teachers have many occasions for interviewing. It is, in fact, a part of the regular work of vocational counsellors, career masters, visiting teachers, supervisors, school health officers, etc.

The preparation of cumulated record cards and case histories has become a well-established technique, involving measurements of intellignce, of educational achievement, of physical condition, and of epersonality, in addition to varied data concerning the history of the individual and of his family. Interview will provide more important insights into the individual case and his problems if any, by drawing out various comments from him. The personal interview is the most important single device available in the differential diagnosis of any complicated case.

Interviews in the field. The interview is the chief method of gathering data in the field. Census-takers ordinarily gather information concerning the entire family by talking to a single representative of the family. Investigation of the social and economic status of the families from which school children come usually involve visiting homes and interviewing parents. Studies of home environment will become increasingly common as educators tend more and more to recognize the roles that such factors play in determining the needs of school children.

Sociologists and economists gather data for many important investigations by means of the field interview. Standards of living and their costs are amenable to such methods.

Interviewing for analysis and appraisal. Charters has indicated a vast field of information relating to the solving of practical problems, which can be tapped through the interview. That is, persons who are notably successful in their various undertakings have certain methods of work, they are guided by certain standards and they react in certain ways. The factors that make for good work constitute important information for the training of others. By ingenious interviewing—and perhaps some observing—one can secure essential differences in the thinking and procedures of successful and unsuccessful workers.

CONDUCT OF AN INTERVIEW

A good interview is more than a series of casual questions and generalized replies. It is a dynamic, interpersonal experience that is carefully planned to accomplish a particular purpose. Creating a friendly, permissive atmosphere, directing the conversation in the desired channels, encouraging the respondent to reveal information and motivating him to keep presenting useful facts require a high degree of technical skill and competence.

Symond refers to important aspects af interviewing, such as, the preview, the initial contact, conditions of the interview, securing rapport, rising action, lessening tension, etc.

There are a number of steps for the fruitful conduct of an interview.

Preparation for the Interview. Interviewing is an art that calls for the highest level of competence. Generally competence in interviewing comes after long years of experience coupled wlth a good background in the theory and the art of interviewing.

Interviewing calls for the most rigorous selection of interviewers and, further. for their most thorough meticulous and painstaking preparation personal charm and who has the tact and ability to meet and to communicate effectively with people. He must be able to make people feel at ease and willing to communicate. He must also be particularly adept at making an effective primary contact, because the success of the interview frequently depends upon the rapport established in the first minute or two.

Besides selecting suitable interviewers, it is necessary to fit interviewer to the prospective interviewee. It is mandatory for instance, that the person who interviews a housewife be sufficiently familiar with her responsibilities to permit two-way communication.

The interviewer must first address himself to the general task of meeting people and understanding them so that he can establish rapport quickly and effectively, overcome resistance where it develops, lead the respondent over embarrassing topics, and generally guide the conversation towards the derivation of adequate answers. He must be able to help people who are inarticulate and unsure of themselves and yet he must avoid projecting his personality into their responses.

Before an interview study is undertaken, the interviewer should undergo rigorous training. This is generally best done through a pilot study. The training programme must incorporate the fourfold approach of :—

1. Convincing the interviewer that he is in need of training.

2. Impressing upon him the problem to be investigated so that he will want to get valid answers.

3. Orienting him to the nature of the problem so that he can see the relevance of the responses he gets, and

4. Providing him with special skills on the basis of which he can accomplish what he is trying to do. Supervised practice in interviewing is essential to the success of an interviewer.

Apart from his skill and training, the interviewer must have a clear conception of just what information he needs, Then he has to prepare appropriate questions to extract the desired data. He will clearly outline the best sequence of questions and stimulating comments that will make the respondent feel at ease and stimulate his flow of conversation. He will find out as much as possible about the interests, beliefs & background of the subjects so that he could gain their confidence and avoid antagonising them.. He should obtain sufficient information to understand their frame of reference. He should make a definite appointment for the interview at a time convenient to the subject. He will conduct the interview in an environment in which the subject is at ease and in a setting which is most natural and suitable for the interviewee.

The preparation for an interview should involve considerable thought. An interview for research purposes cannot be a haphazard affair. It should be pleasant and to some extent informal but underneath it there must be a thread of questions that will give to the interviewer the information he is seeking without gaps and without doubtful interpretations. He will introduce these questions into the conversation at appropriate points.

To be still better prepared be should conduct a few preliminary interviews to detect weaknesses in his methods, manners, questions or recording system.

Establishing Rapport. As we know, interview is largely dependent for its success on the personal ability of the interviewer. It involves certain intimate types of enquiries like questions on initimate personal life & sex or marital harmony. Only a good interviewer who is able to establish sympathetic contact with the subjects can get responses which otherwise cannot be elicited. The nature of this personal relationship requires an expertness & sensitivity that might well be called an art. The initial task of securing the confidence and cooperation of the subject is crucial. As in the case of questionnaire, the interviewer must be able to assure the subject that his responses will be held in strict confidence and will be used for no purpose other than research. The interviewer should be pleasant, efficient, straignt-forward and poised in his manners. He has to even dress appropriately. Talking in a friendly way about a topic of interest to the subject will often dispel hesitation, hostility or suspicion on his part. The interviewer has to use a suitable vocabulary and approach for working with the particular respondent. After removing the distance with the interviewee, he has to establish intimacy, friendship and closeness with him in the interest of investigation. He has to create an enthusiasm in the interviewee towards the subject of study. He has not to be overly sentimental, solemn or sympathetic. He has to avoid adopting a superior, patronizing, clever, cunning or third degree manner.

Eliciting Information. The interviewer has to be an attentive and analytical listener apart from being friendly and courteous in his manners. He has to listen patiently to all opinions and never show surprise or disapproval of a respondent's answer. He has to assume an interested manner towards respondent's opinion and as far as possible should not divulge his own. Throughout the interview he must be extremely careful not to suggest a possible reply.

He has to detect when answers are vague, contradictory, evasive or deceptive. He has to skilfully introduce alternative or more penetrating questions to help the respondent to recall information, amplify statements, clarify his thinking, rectify facts or give more concrete evidence. He has to pace the questions at the proper speed for the respondent. He should ask general questions first and then sharpen the focus of succeeding questions. He has to follow up crucial clues provided by responses and has to inject courteous comments here or there to redirect the interview into fruitful channels. The wording of his questions, his tone of voice, facial expressions or phrasing and timing of questions should be befitting in every way. He has to sense when it is best to approach delicate matters and probe for depth materials.

He has to avoid blaming the respondent and refrain from revealing that an answer shocked, annoyed or displeased him. He has to try to seek the same information in various ways to check the truth of responses. He should try to check some replies against any official records available. He has to terminate the interview before the subject gets tired. Before taking leave he has to express his thanks for the cooperation and generosity of the subject in sparing his valuable time.

The interviewer should throughout keep the direction of the interview in his own hands and avoid irrelevant conversation and try to keep the respondent on the track.

Recording of responses. There are two chief means of recording responses during the interview. If the questions are precoded, the interviewer need only to check mark a box or circle or code. If the questions are not precoded, he is expected to record the responses verbatim. In any case it is suggested that the actual wording of the responses be retained. The interviewer may use some schedule, structured format, or system that should enable him to record notes quickly and accurately. He should legibly record the exact words of the respondent at the time they are spoken or immediately after the interview.

He may also use a tape-recorder or any other electronic device. This instrument should be used without distracting the subject. It is best to employ a device which would retain the actual wording, tone of voice and emotional displays. Recording interviews is convenient and inexpensive and obviates the necessity of writing during the interview. If the responses are noted down during an interview, it may be a distracting influence, both to the interviewer and to the subject. It may often fail in recording the complete details. The tape recorder provides a means of verifying responses later, preserves the emotional and vocal character of replies, and helps the investigator to avoid the omissions, distortions, modifications and errors that sometimes are made in written accounts of an interview

In case tape recorder etc. is not used, the interviewer should make notes concerning any behaviour or conditions which did not conform with the respondent's replies. Along with written details, he should make a record of significant emotional displays, hesitations, stammering, sudden silences or transitions, quick corrections and obvious omissions.

Sometimes it may be considered sufficient to record the gist and the evaluation as the interview goes on. It is, however, advisable to evaluate and interpret the recorded responses later rather than simultaneously.

Interpreting the Interview. The recorded responses can be read over again and again and the interviews recorded on tape may be replayed as often as necessary for complete and objective analysis at a later time.

He should give sufficient thought to verbal expositions and simultaneous reactions of the interviewee. If necessary, he should quote the respondent directly. Paraphrasing the reply, summarizing it in the interviewer's own words, polishing up any slang or correcting bad grammar may distort the respondent's meaning and emphasis.

ADVANTAGES OF INTERVIEW

The advantages of interview as a data collection device have been indirectly referred to while stressing its importance. These can be further summarized as under :

1. It is especially advantageous over a questionnaire in many ways. The percentage of responses is likely to be much higher than in the case of questionnaire. Questionnaires are often shallow and they fail to dig deeply enough to provide a true picture of opinions and feelings. The interview situation usually permits much greater depth. Another advantage of interview over questionnaire is its greater flexibility. It permits the investigator to pursue leads that appear fruitful, to ask for elaboration of points and to clarify the questions which the respondent has not been able to understand. It also permits the establishment of greater rapport and stimulates the respondent to give more complete and valid answers. Again it permits the interviewer to help the respondent clarify his thinking on a given point. The interview also allows the observation of the respondent's facial expressions and other signs of evasiveness, non-cooperation and irregularities. It frequently leads to significant insights in unexpected directions. Its flexibility can also lead to by-products which were not anticipated in the original plan of the study. It is possible for a skilled interviewer to obtain any significant information through motivating the subject and maintaining rapport. The respondents when interviewed may reveal information of a delicate or confidential nature which they would not like to record in a questionnaire.

2. The field worker is personally present to remove any doubt or suspicion regarding the nature of enquiry. The answers are, therefore, not biased because of any misunderstanding.

3. In interview the investigator can create a right type of friendly atmosphere which is very conducive for obtaining desired data.

4. If necessary the interviewer can give assurance or guarantee to the interviewee that the facts will be properly used.

5. It permits even exchange of ideas and information. It is not one-way communication. It provides opportunity for give and take.

6. The respondent's difficulties like poor expression ,and bad handwriting are also avoided as every schedule is filled by the interviewer.

7. The personal contact with the respondent enables the interviewer to probe more deeply into the character, living conditions and

general life pattern of the respondent. These factors have a great bearing in understanding the background of any response.

8. The data gathered through interviews have been found to be fairly reliable.

9. There is possibility of cross-questioning, asking modified or simplified questions and putting supplementary questions.

10. It is by far the only method usable with some categories of persons like young children, illiterates, persons with limited intelligence and those with abnormal state of mind.

LIMITATIONS OF INTERVIEW

1. The major weakness of the interview is the interviewer bias. Research has shown that interviewers tend to obtain data that agree with their own personal convictions. The very presence of the interviewer affects the responses which he gets. To the extent that the interviewer is allowed to vary his approach to fit the occasion, he is likely to project his own personality into the situation and thus influence the responses he receives.

2. Interview is comparatively a costly affair. The cost per case is much higher in this method than in any other data-gathering techinque. When the survey covers a wide geographic area, interview is going to be expensive and also costly in time and effort since it almost invariably necessitates call-backs, long waits and travel.

3. A busy person may prefer to fill out a questionnaire at leisure rather than submit to a long interview.

4. For an adequate coverage, a large number of field workers may have to be engaged and trained in the work of collection of data. All this entails a lot of expenditure and a research worker with limited financial means finds himself in a great difficulty to adopt this method.

5. Since the objectivity, sensitivity and insight of the interviewer is crucial, this procedure requires a level of expertness not ordinarily possessed by an average research worker. That is why it is considered as one of the most difficult techniques to employ.

6. The respondent suffers from four limitations, *i.e.* (*i*) his experience as an interveiwee, (*ii*) his judgement about himself, (*iii*) his accessibility and readiness to divulge the information and (*iv*) his ability to express himself clearly.

7. The recording of data from an interview is full of difficulties. If one writes during the course of the interview the rapport is weakened and the recording interferes with the smooth and natural conduct of the interview and may also encourage suppression of undesirable facts. Writing up from memory has its own perils of wayward, whimsical, preferential and unconscious selection of the material.

8. Tape-recording of the entire interview is likely to be expensive of time and money. Moreover the use of tape-recorder may make the interviewee cautious and scare him away from divulging any secrets.

9. It does not work well with infants, shy people, deaf people, mad people and animals.

APPLICATIONS OF INTERVIEW

The technique of interview is used in many ways for research and non-research purposes. Apart from being an independent data collection tool, interview may play an important role in the preparation of questionnaires and check-lists which are to be put to extensive use. It is an essential part of the administration of various tests like intelligence tests of Binet. It is also a part of the regular work of vocational counsellers, career masters, practical examiners, medical officers, psychiatrists, etc. It is most important in diagnosing mental disorders. It is the chief method of gathering data in the field as during census, social and economic surveys.

It will be helpful to discover the detailed process that the child uses in his thinking. Consequently it may help in finding the causes of errors in academic work, slips of the tongue or pen and failure to pay wholehearted attention in the class. It will enable us to know the methods of work and style of procedure of most successful students, sportsmen, teachers, administrators and student leaders.

This technique was used in the Commonwealth Teacher Training Study to know the traits most essential for success in teaching. By interviewing most successful teachers a master list of traits was prepared. Charters and Whitley used it to study the secretarial duties and traits. To secure a set of activities which could be used as a check-list, a number of secretaries were interviewed. This procedure yielded 871 different duties, & these were submitted in check-list form to 2000 secretaries to obtain the relative frequency with which the activities were performed.

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FOURTEEN

Observation

Analysis of questionnaire responses is concerned with what people think and do, as revealed by what they put on paper. The interview reveals what people think and do by what they express in conversation with the interviewer. Observation seeks to ascertain what people think and do by watching them in action as they express themselves in various situations and activities.

Observation is recognized as the most direct means of studying people when one is interested in their overt behaviour. In questionnaire people may write what they think they do, but this is often different from what they actually do. Similarly in interview they may tell what they think they do but that may also be different from their actual behaviour. The average person is not a very accurate observer of himself.

Observation is a more natural way of gathering data. Restrictions imposed in questionnaire or interview are missing in observation. Artificiality and formality of questionnaire or interview is replaced with reality and informality in observation. Data collected through observation may be often more real and true than data collected by any other method. Whenever direct observation is possible, this is the preferable method to use.

Observation is at once the most refined of modern research techniques. Direct observation has recently come to be looked upon as a scientific procedure. It is undoubtedly the first procedure of science as all scientific data must originate in some experience or perception. As a scientific tool, it may range from the most casual and uncontrolled to the most scientific and precise, involving modern mechanical and electronic means. It can be made progressively more scientific to meet the needs of the particular situation and observation is a fundamental tool even at the most advanced levels of science.

Observation underlies all research ; it plays a particularly prominent part in the survey procedures, but even experimentation is simply observation under controlled conditions. The conditions under which observation takes place may approach and actually satisfy the requirements for a carefully controlled experiment. The general conditions of observation may be controlled by selecting the room, the equipment, the children who make up the group, special forms of stimuli and the observers.

USES AND IMPORTANCE OF OBSERVATION

Observation is employed as a data-gathering technique in many general and educational situations. Direct observation of behaviour has become an important means of appraising the work of progressive schools and of teachers who are interested in certain outcomes in addition to the academic ones. Many of the larger goals of education fall outside the range of the usual academic abilities, embracing in general the social characteristics like co-operation and adaptability, the self-reliant-traits like independence and self-confidence, the dynamic traits like initiative and spontaneity and other elements of the all-round well developed personality. Such characteristics cannot be indexed satisfactorily by the prevalent methods of testing. More can be told about the complete development of a child by observing him from day to day than in any other way. Observation of the pupils gives us answers to such questions as : "Does he work well with a group ?" "Is he regular and punctual ?" "Is he pleasant and cheerful ?" "Does he read good books during leisure time ?" The observational technique is also recommended to cover such general fields as self-reliance, responsibility for personal growth, interest, etc.

A number of studies of infants & older children have been made to analyse their activities and characteristics by direct observation. Not only Child Psychology is a major field of observation but Abnormal Psychology is another field where neurotics and psychotics are studied by way of observation. Similarly in Industrial Psychology, at the time of job analysis, finding out the working conditions of the workers, noting their manual and social behaviour etc. are the situations where observation can be effectively employed.

In Educational Psychology, every teacher has to observe his students in different situations at different times, especially when the teacher deals with a backward child, a retarded case, a gifted student, a delinquent or a handicapped student.

In normal cases observation is employed when children are to be studied while busy in different activities such as games, dramatics, social service, etc. In the testing procedure, observation has got its own place and this is the reason that individual tests are considered better than group tests because there is a greater scope of observation of the subject on the part of the examiner. In Experimental Psychology observation is an integral part of any experiment. In Animal Psychology this will be used as the major tool for investigation and research. In the field of Education, observation comes handy to judge the pupil teacher's skill in teaching. Assessment of practical skills can be better done by observation.

A different form of observation is represented by the anecdotal technique. This consists in writing down each day certain revealing sayings or doings of children. Over a long period of time, such records give a significant picture of a child's development.

Observation is indispensable for studies on infants who can neither understand our querries nor express themselves clearly. In the case of animals, observation is the only way out. For deaf and dumb persons, for serious cases of abnormality or mad persons, for non-cooperative persons, for too shy persons and for persons who do not understand our language, observation will be the only appropriate tool.

Simple observation of physical aspects of school buildings, or students & teachers, etc. is made through physical examination, measurement, assessment & comparison with specified standards. The characteristics of a school building can be studied by observing & recording such aspects as materials of construction, number of rooms for various purposes, size of rooms, amount of furniture and equipment and presence or absence of certain facilities.

During a game a coach may sit high in the stands to make strategic observations like—who missed his tackle, who missed a pass, who fumbled near the goal, who tried to monopolise the show, etc. These observations will form the basis to improve the performance of the team.

The method of laboratory experimentation seeks to describe action or behaviour that will take place under carefully arranged and controlled conditions. The method of descriptive research seeks to describe behaviour under less rigid controls, under more natural conditions. For studying the behaviour of children in a classroom situation, it is necessary to observe what they actually do in a real class room.

H.C. Morrison has devised an observation procedure with record blanks for ascertaining the amount of attention during a class period. Schmidt has developed an observational technique for pupils of industrial arts that goes beyond knowledges and skills into the fundamentals of habits, attitudes and appreciations.

CHARACTERISTICS OF OBSERVATION FOR RESEARCH

Jahoda has described the observation method as scientific technique to the extent that it, "(a) serves a formulated research purpose, (b) is planned systematically rather than occurring haphazardly, (c) is systematically recorded and related to more general propositions and (d) is subjected to checks and controls with respect to validity, reliability and precision."

The fundamental virtues are clearness, precision, impartiality and caution. Common vices are—rough and ready records, reliance on vague impressions, acceptance of second hand evidence, and picking the facts to suit. Since observers are fallible mortals, we readily understand the importance of cooperation, of independent observation on the same subject, of instrumental means of increasing the range and delicacy of our senses, and of automatic impersonal methods of registration such as that supplied by photography.

It is necessary to make a distinction between observation as a scientific tool and the casual observation of the man in the street. Every casual observation, supervisory observation or tutorial observation is not a research observation. More specifically, scientific observation must comply with the following criteria :

1. Scientific Observation is Systematic

It is not haphazard or opportunistic. Again it is not a chance dropping in, when one happens to be passing by. The length of the observation periods, the interval between them, and the number of observations are carefully planned. There are dependable arrangements for controlling the situation if special factors are to be studied, *e.g.* studying of honest behaviour, sportsman spirit, leadership qualities, etc.

2. Observation is specific

It is not just looking around for general impressions. It is directed at those specific aspects of the total situation which are assumed to be significant from the standpoint of the purpose of the study. The layman, for example, frequently overlooks what is crucial while he devotes his attention to what is irrelevant. There are definite things for which a scientific observer looks. These things are carefully defined so that there is practically nothing left to the discretion or preference of the observer. All items of observation are ironed out in the preliminary trials of the technique. The phenomenon is properly dissected beforehand and its significant aspects are correctly identified.

3. Scientific observation is objective

It is free from bias as far as possible. It should generally be guided by a hypothesis. However there is the risk that prejudgement on the part of the observer may colour his perceptions and blind him to certain aspects of the actual situation. The observer who is convinced that under-achievers are lazy is likely to find many confirming instances. Prejudgement is a liability, particularly in the early stages of observation, where the observer must maintain maximum flexibility and open-mindedness. Although it is possible that a hypothesis may orient the invesigator in the wrong direction, he cannot deal adequately with a complex situation if he simply looks at everything on an opportunistic basis.

The observer must maintain his neutrality, not only must he consider hypotheses as something to be tested rather than proved, but he must maintain a flexible attitude so that he can deviate from his original plans when such deviation appears advisable.

4. Scientific obsevation is quantitative

Although many important phenomena cannot be qnantified, it becomes almost imperative to devise some means of quantifying observations in order to increase their precision and to fecilitate their analysis. Even the quality should be converted into quantity. Qualitative data is subjective and quantitative one is objective in itself and can further be interpreted in objective manner. This is an important characteristic of science.

Usually the number of instances of a certain type of behaviour are recorded. Sometimes it is the total duration of the particular conduct during the period of observation. As far as possible the information is gathered in quantities *e.g.* the distance travelled by a child, frequency of a good conduct, intervals of rest during the day, etc.

5. The record of observation is made immediately

The findings are not entrusted to memory, but notes are made as promptly as possible. If we rely on memory, the factor of forgetting will enter and affect it.

6. Observation is expert

The expert observer knows precisely what he is looking for in the total situation. He not only structures the phenomena he is to observe, but he also plans his observation to prevent his overlooking any significant aspect. He is aware of the pitfalls to be avoided and he has the background of experience both in research and in the problem area. He is adequately trained in the use of this technique. He is able to differentiate between relevant and irrelvant points, facts and interpretations, symptoms and causes etc.

7. Observation is verifiable

Its result can be checked and substantiated. Observation must comply with the usual criteria of reliability, validity and usability. It may be possible to check its procedure by comparing the results of different observers, or by repeating the study. Such checks, however, do not insure validity which depends essentially upon the definitions of the acts which are to be regarded as falling within the category being studied.

TYPES OF OBSERVATION

The observer needs to know beforehand the type of observations he is to make—whether he is simply to note the occurrence of certain events or whether he is to make a judgement as to their intensity, duration and apparent effect.

Structured and Unstructured Observation

In the early stages of an investigation, it is necessary to allow maximum flexibility in observation to obtain a true picture of the phenomenon as a whole. Premature attempts to restrict the observation to areas considered significant involves the risk of overlooking some of the more crucial aspects. The investigator must be ready to shift from his original plans to the study of aspects which he sees as more significant. As the investigation proceeds, and the phenomenon is seen with greater clarity, the investigator must orient observation towards the more precise investigation of restricted aspects of the situation in an attempt to derive more rigorous generalizations. The observation is wide and unstructured in the early stages, it gets restricted and structured as the investigation proceeds.

Participant and Non-participant Observation

When the subject of observation is the behaviour of a human being or perhaps an animal—the relationship that exists between the observed and the observer is of primary concern, since the very presence of the latter is likely to cause some shift in the behaviour which he is trying to observe. Some researchers rightly feel that with the possible exception of observation through one-way screens and hidden microphones, it is not possible to observe without some distortion of the phenomenon being observed.

Observation can be either participant or non-participant. In participant observation, the observer works his way into the group he is to observe so that, as a regular member, he is no longer regarded as an outsider against whom the group needs to guard itself. Sociological studies have been conducted in which the investigator even joined groups of hoodlums and prisoners in order to understand them better. In non-participant observation, the observer remains aloof from the group. He keeps his observation as inconspicuous as possible. In some other studies, the observer may simply pretend to be a by-stander or may even hide behind one-way screen so that his presence is not even suspected.

The advantages and disadvantages of participant and non-participant observation depend largely on the situation. It is probably true that nothing can give a better insight into the life of criminals, for instance, than living with them continuously for some time. On the other hand, participation does not eliminate the distorting influence of the observer. Also the participant observer is likely to adapt more and more to his role as a participant member of the group and become more and more blinded to the peculiarities which he is supposed to observe. As he develops friendship with the members of the group, he is also likely to lose his neutrality and his objectivity and accuracy in rating things as they are.

Some research workers feel that it is best for the observer to remain only a partial participant and to maintain his status of scientific observer apart from the group.

TOOLS FOR OBSERVATION

Various tools have been devised to help the observer in making more objective and reliable observations and to systematize the collection of data. In addition to the score cards, rating scales, and various tests, some of the following techniques are commonly employed :

Check Lists and Schedules

These instruments list items (carefully defined, observable factors) that are relevant to the problem and group them into categories. After each item a space is provided for the observer to write in a few descriptive words or to indicate the presence, absence or frequency of the phenomenon's occurrence. These guides enable investigators to record many different observations quickly and rapidly and ensure that they do not overlook relevant evidence. They also tend to objectify the observations and provide for a uniform classification of data. Some check lists are designed so that the researcher can arrive at a score that enables him to make comparisons with other data.

Time Sampling

This technique requires that the observer records the frequency of observable forms of occurrences during a number of definite time intervals that are systematically spaced. For example, if a teacher desires to ascertain the type of activity engaged in by a student he records observable forms of behaviour that this student exhibits during a specified five-minute interval in history class each day for a fortnight. Rather than recording everything the boy does, the teacher may wish to tabulate the occurrence or non-occurrence of one objectively defined form of behaviour, such as "the frequency of class participation." Several short, well-defined observations provide a more typical picture of behaviour than a few long periods of observation.

Time sampling is a valuable technique because it permits observable instances of behaviour to be quantified directly. By making a series of observations, a score can be obtained that shows the number of times the subject exhibited a particular form of behaviour. These obtained scores lend themselves rapidly to statistical treatment.

Behavioural Diaries and Anecdotal Records

Sometimes rather informal methods are employed to collect data. When a pupil is involved in a significant incident the observer may write a factual statement about what the subject said or did, note the data of the incident, and describe the situation in which it occurred. After accumulating a series of direct observations of significant behaviour over a period of time, he may have sufficient data to gain considerable insight into the growth, development and adjustment of the subject.

Anecdotal records are of little value, if observers are not able to report the relevant facts objectively. Some investigators make the mistake of accumulating only negative data; others record vague generalizations or a subjective interpretation of it rather than recording an exact description. Sometimes investigators generalize about the behaviour too soon. The greatest liability of the anecdotal technique is that considerable time is required to record, analyse and interpret the data.

Mechanical Instruments

When several observers describe the same incident, their reports often vary because of their personal biases, selective preception, emotional involvements or capricious memories. Because mechanical instruments are unaffected by such factors, they can obtain a more accurate record of an event. Motion pictures and sound recordings, for example, preserve the detail of an incident in a reproducible form which can also be checked by other research workers. Films have been used to analyze audience reactions, to make slow-motion analysis of complex activities that could not have been studied under normal conditions and to serve many other purposes. Some mechanical instruments not only give a reliable account of what happened, but also report it in a quantified form. Dynamometers to measure the srtength of the hand grip, electromyographs to measure the activity of a muscle, etc. are some such instruments.

Although mechanical devices may produce more refined and reliable data than human observers, they are subject to certain limitations. They can only be employed more easily in carefully controlled laboratory experiments. The presence of the instrument sometimes alters the behaviour of the subject. The money and time required to construct, utilize, or maintain an instrument may be prohibitive. Both crude and complicated instruments present problems, and, of course, well-designed, precise instruments cannot yield reliable data if they are not properly employed and maintained.

VALIDITY OF OBSREVATION

The following conditions must be satisfied for ensuring validity of the results of observation:

1. It is essential that actual observations be made of the on-the-job activity and the product of such activity.

2. The aims and objectives of the activity must be known to the observer. Otherwise it will be difficult for the observer to identify success or failure.

3. The basis for the specific judgements to be made by the observer must be clearly defined. The data can be objective only if all observers are following the same rules and have the same criteria for making judgements.

4. The observer must be qualified to make judgements regarding the activity observed.

5. Reporting should be accurate. The principal problems here are those of memory and communication.

SYMONDS' LIST OF REQUIREMENTS

Symonds gives a list of detailed requirements if the observation is to be satisfactorily done. He gives a list of nine essentials of good observation which are : good eyesight, alertness, the ability to estimate, the ability to discriminate, good physical condition, an immediate record, good perception, freedom from preconceptions and emotional disinterest. Most of these constitute requirements which the observer himself must meet if he is to qualify as an expert.

QUALITIES OF A GOOD OBSERVER

1. *The observer should possess efficient sense organs.* An individual who is hard of hearing would be unable to detect all instances in which children mispronounce. A nearsighted person would be handicapped in the study of children at play.

2. *The observer must be able to estimate rapidly and accurately.* He often must estimate quantitatively assigning rating values to certain characteristic behaviour like shyness, ahd decisiveness of the child.

3. *The observer must possess sufficient alertness to observe several details simultaneously.* He must be capable of sustained attention in order to remain aware that certain behaviour is occurring continuously.

4. *The observer must be able to control the effects of his personal prejudices.* He must record observation on the basis of what he actually sees or hears and not on the basis of what he believes he should see or hear.

5. *The observer should be in good physical condition.* His accuracy in observing may be detrimentally affected by loss of sleep or fatigue, thus rendering his attention ineffective. A nervous or overwrought individual may base his report upon illusory sensory responses.

6. *The observer must be able to record immediately and accurately the results of his observations.* Postponement of recording an event for a few minutes may increase the likelihood of inaccuracy.

VARIOUS ROLES OF THE OBSERVER

The observer has to assume various roles depending upon the nature and rigour of his observation and the type of group or situation which he is going to observe. There are four important roles expected of him :

(*i*) **A visiting stranger.**

(*ii*) **An attentive listener.**

(*iii*) **An eager learner.**

(*iv*) **A participant observer.**

1. A visiting stranger

There may be no need on his part to develop intimacy with the subjects to be observed. He may have no time to stop and stay with the subjects even for a while. He has to collect his data in the shortest possible time. He enters the scene as a stranger and goes away as a stranger. He reaches the scene as an onlooker, stays at a distance, tries to remain unnoticed, does not disclose his identity and purpose, and does not evoke any suspicion among the persons being observed. May be he comes to collect data confidentially and does not want anybody to notice and recognize him.

2. An attentive listener

In a classroom situation, he listens to what the teacher speaks and also to the responses of the students. He may also have to observe the students' participation in a seminar, a discussion, a symposium or some other competition of this type. He may go to attend a meeting not as a participant but as an observer. It is the case with the correspondent or press reporter who sends a news about a public meeting, a rally, a demonstration or a riot.

3. An eager learner

He may choose to observe the children to learn about their development and its problems. His observation may enable him to know their likes and dislikes. By observing the working of a model school he may learn many ideas and practices which may help him to work better in his own situation. The students go on tours to observe educational institutions of national fame and learn new things from there. Selected teachers are sent to foreign countries to observe their educational institutions and learn new things from them. One goes as a visitor to an exhibition, museum, a dam site, an industrial fair and learn something as an observer.

4. A participant observer

He lives in the community or social setting under study, as he takes part in the activities and functions of the particular group. It enables him to get the feel of what the various activities and processes mean to the regular participants. Even as a participant observer he takes an objective position in the group. In this role, he is better able to avoid misleading information because of his closer contact with the field situation. It involves complete identification with the group. His impressions are more reliable because he stays with the group for a sufficient duration. He can generally get at the depth material and can do research in delicate areas.

PLANNING EFFECTIVE OBSERVATION

1. Sample to be observed should be adequate consisting of an appropriate group of subjects.

2. Units of behaviour to be observed should be clearly defined. At the same time the observer is aware of the wholeness of what is observed. While he is alert to significant details, he knows that the whole is often greater than the sum of its parts.

3. Method of recording should be simplified.

4. Detailed instructions may be given to observers so as to ensure consistency and to eliminate differences in the perspective of observers.

5. Too many variables should not be observed simultaneously or in a single observation.

6. Excessively long periods of observation without interspresed rest periods should be avoided.

7. Observers should be fully trained and well equipped.

8. Conditions of observation should remain constant.

9. Number of observations should be adequate.

10. Records of observation must be complete and comprehensive.

11. Length of each observation period, interval between periods and number of periods should be clearly stated.

12. Interpretations should be made objectively.

EFFORTS TO OBJECTIFY OBSERVATION

1. To increase the range, richness and accuracy of his observations, and to guard against errors in perception, a scientist acquires a broad background of the field in which he works.

2. To sharpen his perceptive powers, he acquires abundant practice in the art of examining the phenomena with an alert and questioning mind. Like the proof reader, the tea taster or airplane spotter, he trains himself to discriminate between similar stimuli.

3. Since emotional and intellectual biases can prevent accuracy of observation, he makes a serious study of views that differ from his own. Whenever possible. he repeats observations to see whether the results will be the same on each occasion.

4. Because human faculties and biases can introduce errors, the observer uses mechanical devices or tools for data collection.

5. To avoid overlooking important facts, he may construct a list of items to be noted invariably during each observation.

6. He writes his descriptions in precise and concrete terms so that no other interpretation can possibly be placed on his words.

7. Observation is carefully planned, systematic and perceptive. The observer knows what he is looking for and what is irrelevant. He is not distracted by the dramatic or the spectacular.

THE TRAINING OF OBSERVERS

Observation is no better than the people who use it. It is necessary for anyone who conducts an observational study to undergo extensive training in order to ensure validity and reliability in his observations. Sportscasters and announcers, for example, are much more adequate observers of a sports event than is the average fan. They can see many things that escape the layman. They can anticipate plays and knowing what is likely to occur, they can orient their total observation to the significant components, while the fan simply scatters his attention on irrelevant aspects. Training in observation is particularly important in the social sciences, because the observer is frequently faced with determining which factors are significant out of the multiple phenomena occurring simultaneously.

It must also be remembered that some people are just not good observers, either in general or with respect to certain phenomena in which they may be emotionally involved. Observers should be carefully selected and in the course of their training, a check should be made of their suitability for the observation of the particular phenomenon.

One is likely to think that such an everyday experience of seeing is commonplace and simple. This is not the case, because it is not the physical side of seeing that is the most important, but the psychological side, and this requires the building up of a recognition readiness before skilled seeing can take place. The observer is not merely to note the occurrence of certain events, but he is to make a judgement as to the intensity, duration and apparent effect of the occurrences.

PREPARATION FOR OBSERVING

The principal problems arising in connection with observing fall into four groups – planning the administrative aspects, defining the activities, arranging for the record, and training oneself to observe.

Under administrative aspects are included those aspects of the study such as securing an appropriate group of persons to observe, deciding and arranging any special conditions for the group, determining the length of each observation period, the interval between periods and the number of periods. These are in part problems of adjusting to local conditions and not much can be said in general. On the other hand, one must keep in mind the general principles of sampling.

In defining the activities which are to be observed, the object should be, first, to include those activities which are true representatives of the general category which one is studying, and, second, to define them so carefully that questions as to what is included do not arise. These two steps cannot be achieved without spending enough time, careful analysis of what one is trying to do, probably some reading, and actual observation in the field. The validity of the results will depend in large part upon how well one chooses and defines activities that will contain the essential elements of the field.

The definitions or specifications, will, of course, not appear on the record form that is used; they must be well understood in advance. The form for recording will be arranged so as to make note-taking easy and rapid. Much time can be saved by the appropriate use of symbols, abbreviations and some use of shorthand. The investigator will have to subject his record form to actual trial along with critical analysis of the blank during and after trial. In designing a record form, one will try to achieve convenience in analyzing or copying off the data from the original record. If the record is to be made by a stenographer, a moving-picture operator, or by some other special means, one should make preliminary or exploratory observations in advance.

Regarding the fourth phase of the training of the observer himself, a detailed description has been provided already.

EXECUTION OF OBSERVATION

A good observation plan and preparation may not lead to success unless it is followed up with skill and resourcefulness. An expert execution demands: utilizing the training received in terms of expertness, proper arrangements of special conditions for the subjects, occupying proper physical position for observing, focusing attention on the specific well defined activities, observing discreetly keeping in mind the length, number and intervals of observation decided upon, and handling well the recording instruments to be used.

Recording of what is being observed is an important aspect of observation. In certain cases, it can be done directly with the help of cameras, sound tapes and other mechanical means. This type of recording is ideal since it gives an animated picture to be studied at leisure and capitalizes on the dynamic aspects of the situation. It also permits other observers to study the records and pass judgement on the adequacy of the interpretation.

In most instances such ideal recording is out of the question. Taking long hand notes is generally inadvisable since it is too time-consuming and likely to disturb the observational process. Shorthand may have advantages in certain cases. Probably the most commonly used, and generally the most practical means of recording observational data is through the use of a checklist consisting of key words, which the observer can check as he goes along and from which he can later reconstruct the observation.

There are times when any amount of record-taking during an observation is inadvisable, and the observer must rely on his memory for the reconstruction of his observation. In such cases he should record his observations as soon as possible after the actual observation. There are, on the other hand occasions when the appraisal that is required can be made only on the basis of the total observation and any premature attempt at judgement will produce only incomplete and inaccurate appraisals which will bias later observations. In such instances the total picture is to be seen in proper perspective.

INTERPRETATION OF OBSERVATION

The observer is more than a machine merely registering what is going on, he is a scientist investigating a problem. Drawing meaningful inferences from the data may require a high level of sophistication and imagination.

Interpretation can be done directly by the investigator at the time of his observation. The observer may be in a better position to interpret what he observes than someone who has to reconstruct the situation secondhand. Where several observers are involved, on the spot interpretation introduces the problem of uniformity in interpretation. In such instances, it may be be best for the observer merely to record his observations and to leave the matter of interpretation to an expert who is more likely to provide a unified frame of reference. It must, of course, be recognized that the interpreter's frame of reference is fundamental to any interpretation and it might be advisable to insist on agreement between interpreters of different backgrounds.

LIMITATIONS OF OBSERVATION

1. Establishing the validity of observation is always difficult. Many of the items of observation cannot be defined with sufficient precision. To attempt, to define or isolate these aspects may involve false definitions and consequently, invalidity.

2. The problem of subjectivity is also involved. A person, tends to see what he knows. If a teacher, a doctor and architect inspect a school building, each will see the things that are especially known to him and other things are likely to escape his attention.

3. There is also the danger of concentrating in an observation on the aspects of limited significance simply because they can be recorded objectively and accurately.

4. There is the possibility of distortion of the phenomena through the very act of observing. Observation is self-interfering. It introduces in itself a bias, the direction and extent of which is relatively unknown and unknowable. Such distortion is difficult to eliminate, but it can be minimized through the proper choice and location of observers, inconspicuous recording, and other attempts at establishing observer neutrality.

5. Also the observer tends to see only those things which he wants to see. All human beings who are exposed to the same experiences do not necessarily perceive the same things. Various observers, observing the same event, not only miss seeing some important things, but also report details that are mere fabrications. Perceptions are subject to distortions because of the obrerver's strong personal interests, emotions, motivations, prejudices, mental sets, sense of values, physical condition and errors of inference.

6. Usually when an observer goes to the scene, the situation is new to him. Certain aspects attract his eye and he is likely to observe these

very keenly ignoring other equally significant aspects. He has to safeguard himself against merely observing unique and striking fragments torn out of their context.

7. The incidents described may be samples of rarely occurring behaviour. The observer fails to obtain an adequate sample of data on which to base conclusions. He has little control over the physical situation, it is difficult to get information sufficiently free from complicating co-occurrences to give a clear picture of what is involved. This is particularly true in an unstructured situation where so many things can occur at once that it is difficult to attend to them all. The phenomena is to take its own course and the situations are to develop, as these would, no matter whether these suit the convenience and plans of the observer or not.

8. The lack of competence of the observer may hamper validity and reliability of obsesvation. He must have a clear perspective of the nature of the phenomena, a valid frame of reference and a freedom from personal bias. Generally, greater validity and reliability is obtained by having two or more observers make parallel observations.

9. The people being observed become conscious and begin to behave in an unnatural manner. They try to pose and exhibit. The situation does not remain real and natural.

10. There are certain situations which the observer will not be permitted to observe and he is that way helpless.

11. It is a slow and laborious process. A particular situation which is desired to be observed might not occur for a very long time.

12. The events may not be easily classifiable because of the observation remaining focused mostly on the critical and unusual incidents.

13. The data may be unmanageable. There may be lack of agreement among the observers and so it may not be possible to have any clear-cut categories of behaviour. Besides, it would be difficult to arrange the behaviours along a continuum.

14. It is going to be a costly affair. It involves expenses on travelling, staying at the place of phenomena and purchasing of sophisticated equipment.

FIFTEEN

Appraisal Procedures

Educational data are collected by use of many devices e.g. tests, questionnaires, interviews, observations and counting techniques. The collection of data, even with valid and reliable instruments is however, only a part of larger process of research and appraisal. The worth or meaning that may be assigned to the data obtained is of equal importance. Appraisal is thus a much broader term than measurement since it involves not only the collection and analysis of data but the placing of some value upon it or the reaching of a conclusion regarding its worth.

Appraisal leans more heavily upon the human element than do the objective sciences, because appraisal is undertaken for the specific purpose of including the human element. It is not an attempt to measure objective characteristics, that can be done by the usual methods of the physical sciences. It is rather an attempt to determine the effect of these characteristics upon human beings. It is concerned primarily with human values and secondarily with the physical attributes to which these values are, somewhat momentarily attached.

Appraisal is a form of classification or scaling according to subjective values. There are many practical problems in which it is most important of all research techniques. The more nearly we get to the heart of human problems, the less completely we can depend on approaches that are acceptable from the stand point of formal characteristics of objective science. The social scientists are confronted with problems which differ fundamentally from those of the physical scientists.

Appraisal procedures are generally divided into two groups, the first group involving direct judgements, and the second group being more objective in form, but involving judgement in the preparation of the instruments. The relatively more objective instrument must have calibrated in terms of human judgement when it was constructed. In the procedures which are more subjective the value which is assigned to any specimen being rated depends more or less on the individual doing the rating, and it may vary with the same individual from one time to another. We should not forget, however, that even objective science of the usual sort is not entirely free from observational error. All measurement—even measuring short distances—contains some inexactness and, if we make the units of measurement small enough, the observation will vary for the same person from time to time and from one observer to another. In the process of human appraisal, we must expect reasonable variation from time to time, or place to place, or between one judge and another. As judges, human beings are also something more than inert measuring sticks, they have a large number of very unstable characteristics of response. Appraisal is simply the procedure by which we secure and make overt these characteristically variable reactions. Whatever its scientific standing, we recognise that for certain purposes an index of human values may be more important than any number of physical measurements made perhaps with incredible accuracy and reliability.

The discussion will now turn to various types of rating and their applications. The most direct form of evaluation is known as *direct comparison*. It consists in the comparison of various specimens that can be brought together, studied, and ranked in order. This form of appraisal is most likely to occur in the construction of a schedule or scale. An investigator secures the cooperation of a number of persons, referred to as judges who rank or rate the objects with which he is concerned. This process is commonly referred to as the *jury techinque*, since it involves the pooled judgements of a number of persons. Perhaps the commonest form of this technique is the rating of items in a list. Hurd's study of pressing problems in education is a relevant example. In order to ascertain the most pressing problems, he scanned current educational literature and secured a list of 102 constructive criticisms. He submitted these to 154 judges to pick out the most important ones. Forty-three of the items were rated as very important by at least 80 per cent of the judges, and these were reported by him as important points of attention in making educational progress.

Another illustration of jury techinque is to be found in the Commonwealth Teacher-Training Study. One part of this study had for its purpose the ascertaining of teacher traits that are important for successful work. A master list of twenty-five traits was secured by interviews and subsequent analysis. This master list was submitted to twenty-five judges (experienced school administrators) to rate the traits on the basis of importance. On the basis of these ratings by different judges, complete ranking of the twenty-five traits was finally deduced.

The ranking of a group of human beings may be regarded as constituting a second type of direct comparison. One may be requested to rank the pupils in a class, or to rank the induividuals of any other group on one or more characteristics. This ranking requires judging that one individual is higher or lower than another one in the group, with respect to the particular charcter on which they are being ranked.

A third type of direct comparison is afforded by scaled specimens, such as a handwriting scale or a composition scale. The user compares the specimens to be rated with those which constitute the scale to determine whether his specimen is better or poorer than a certain sample in the scale. When he finds the approximate position which his specimen would occupy on the scale, he assigns the appropriate scale value to it. This requires less judgement than rating without the scale. The scaled specimens also afford an objective representation of values, which aid in preventing undue variation in judgement from time to time.

Scaling Specimens for later use to serve as standards of judgement is done through a systematic procedure. The technique of constructing attitude scales utilizes the same fundamental principle, which has been described later on.

Some of the data-gathering techniques which are based on appraisal procedures are being discussed below.

Underlying Assumptions. Two principles, on which appraisal instruments are based, represent fundamental assumptions. First, it is assumed that better judgement can be secured on the significant aspect of an object (or situation) by centering attention on one aspect at a time. The second, fundamental assumption involved in all of the instruments which yield a general total or composite rating is that general value can be approximated by a summation of the value of parts.

CHECK LISTS

The check lists consist of a list of items with a place to check, or to mark yes or no. The chief purpose of the check list is to call attention to various aspects of an object or situation, to see that nothing of importance is overlooked. It is a simple laundry-list type of device, consisting of a prepared list of items. It is a type of questionnaire in the form of a set of categories for the respondent to check. It systematizes and facilitates the recording of observations and helps to ensure the consideration of the important aspects of the object or act observed. It ensures the completeness of details of the data. Responses to the check-list items are largely a matter of fact, not of judgement.

Its Uses. The check-list is an important tool in gathering facts for educational surveys. It may also be used as a form for recording in observational studies of behaviour. When used as a sort of scale to yield a score, it is an instrument often used in educational appraisal studies—of school buildings, property, plan, textbooks, instructional procedures and outcomes, etc. For example, one check-list contains the points one should look for when checking over plans, details, and specifications of the architect, including such aspects as heating, ventilation, plumbing, design, materials, electrical work and other special features. There are check-lists designed for possible economies in a school, the purchase of school supplies, appraising of the superintendent's report, and the organisation of high schools.

Check-lists are also applied to classroom instructional activities, the studying of the working habits of students, the supervision of classroom instruction, and the teacher-pupil relationships. The check-lists which were built up in the Commonwealth Teacher-Training Study may be used in a number of ways both for analysis and for evaluation. The extensive list of teacher activities, particularly with the frequency and ratings attached to each activity, provides an important means of checking courses of study for the training of teachers. Another use of the list is the checking of textbooks which deal with topics related to teaching. One may also go farther in analyzing textbooks by noting the depth of treatment of each topic.

Personality is also sometimes rated by means of a check-list. It would be possible, for example, to use the list of traits and trait-actions derived in the Commonwealth Teacher-Training Study as a check-list for the personality traits of a school worker. Hartshorne and others have made use of check-lists in the Character Education Inquiry. A comprehensive list of items pertaining to all the possible personality or character traits is prepared and the statements are checked by the subject himself. The response of each statement will reflect some aspect of his personality/character. Check list is used for knowing the interest of the subject also, Kuder's Interest Inventory and Strong's Interest Blank are essentially check lists.

Hints on constructing and using a Check-List.

1. The list of items in the check list may be continuous or divided into groups of related items.

2. These lists are formulated on the basis of the judgement of experts and then each item is evaluated in respect of the number of favourable and unfavourable responses.

3. The items are arranged in categories and the categories in a logical or psychological order. Related items are grouped together.

4. Terms used in the items are clearly defined.

5. An intensive survey of the literature is made to determine the type of check lists to be used in an investigation.

6. Items are arranged in such a way that they are discriminative in quality i.e. to secure the required information and details.

7. Check lists have the quality of completeness and comprehensiveness. A pilot study is quite helpful in this direction.

Four Common Styles of Constructing Check Lists. Check list items can be arranged in several ways. However Kempfer suggests the following four common styles of arrangement :

1. In one of the arrangements, all items found in a situation are to be checked. For example, a subject may be asked to check (√) in the blank beside each activity undertaken in a school.

– Games and Sports

—Morning Assembly

—Mass Drill

—Scouting

—Dramatics

—N.C.C. Training, and so on.

2. In the second form, the respondent is asked to check with a yes or no or asked to encircle or underline the response to the given item, for example,

(*i*) Does your school have a house system ? yes/no

(*ii*) Do you have open shelf system in your school library ? yes/no,

(*iii*) Does your school have a separate common room for girl students ? yes/no

3. This is the form in which all the items are positive statements with checks (√) to be marked in a column on the right, for example,

(*i*) Half of the students in the school belong to scheduled castes. ( )

(*ii*) The school functions as a community centre. ( )

(*iii*) The parent-teacher association of the school is an active organisation. ( )

4. In the fourth form, the items are presented in sentences and the appropriate response out of the supplied responses is checked, underlined or encircled, for example,

(*i*) The student's union organises various student activities—weekly, fortnightly, monthly, irregularly.

(*ii*) The staff meeting is held—fortnightly, monthly, yearly, irregularly.

(*iii*) The periodical tests are held—fortnightly, monthly, quarterly, irregularly.

The investigator has to select the style appropriate to his problem and queries. He may use a number of the above forms or all of the above forms in combination.

Analysis and Interpretation of Check List Data. The tabulation and quantification of chech-list data is done in the same way as of the questionnaire responses. Frequencies are counted, percentages and averages calculated, central tendencies, measures of variability and coefficients of correlation computed as and when required. In long check lists, where related items are grouped together category-wise, the checks are added up to give total scores for the categories in question. Such category-wise total scores can be compared between themselves or with similar scores secured through other studies.

The conclusions from check-list data should be arrived at carefully and judiciously keeping in view the limitations of the tool as well as those of the respondents.

RATING SCALES

It is probably the most commonly used instrument for making appraisals. Many of the variables with which research is concerned cannot be measured directly, the degree of their existence has to be estimated on the basis of subjective judgement. The variables are of such a nature that they can be ranked or rated only in crude categories along a certain continuum in each case. Rating differs from measurement in the refinement with which classification can be made. Rating implies the ability to estimate the status of a phenomenon or trait—that is, to make a subjective judgement of its status. Rating is a term applied to expression of opinion or judgement regarding some situation, object or character. An individual, for example, may be rated with respect to various aspects of efficiency. Opinions are usually expressed on a scale of values. Rating techniques are devices by which such judgements may be quantified.

Suppose it is intended to measure an individual's loyalty. There are no footrule methods, which apply to such a trait. After a large number of specific characteristics or traits bearing upon loyalty have been formulated, ratings may be made from several points of view and combined into a single score.

Ratings can be obtained through one of three major approaches : 1. *paired comparison*, 2. *ranking*, and 3. *rating scales*. The first attempt at rating personality characteristics was the man-to-man technique devised during World War I. This technique calls for a panel of raters to rate every individual in comparison to a standard person. A similar approach is to compare every single individual in a group with every other individual, and to arrange the judgements so derived in the form of a scale. The more common and more practical method of rating is based on the rating scale, a procedure which consists of assigning to each trait being rated a scale value giving a valid estimate of its status, and then combining the separate ratings into an overall score. It is assumed that a more valid appraisal of a phenomenon can be obtained by the summation of the separate ratings of some of its critical components than by a general overall judgement.

According to Goode and Hatt, *the design of rating technique* must always take into account the existence of three elements ; the judges who will do the rating, the phenomena to be rated, and the continuum along which they will be rated. The scale may take any of a number of different forms, it may be simply a series of numbers, or a graduated line, or quantitative terms such as 'good', 'poor', etc. or a series of named attributes peculiar to each scale, or a series of carefully worded descriptions of states representing different degrees of each aspect to be rated. The procedure may consist simply of statements which describe various forms of individual's behaviour, such as Talks too much, Accurate but very deliberate, Works well without supervision, etc. Sometimes specimens of work i.e. handwriting representing various levels of merit, for example, may be placed on a continuum according to values determined by a jury.

Uses of Rating Scale. A simple form of rating scale is commonly employed in judging contests of various kinds such as speaking, declamation contests and music competitions.

Rating scales have been put to extensive uses in the field of rating teaching and teachers. This process extends to the selection of teachers and the prediction of teaching success. Closely related to the field of teacher rating is the general area of personality and character rating. These fields constitute the chief application of rating scales and instruments of many varieties have been constructed. There are scales with various degrees of refinement in the description of traits and of different levels of each trait. There are also a number of self-rating scales. Two rating scales should receive separate mention here. The first is Scott's Army Rating Scale, commonly known as the Man-to-Man Scale. One thinks of persons he knows who represent the highest degree, the lowest degree, etc. of each quality as it is described on the scale. He then compares the individual to be rated with these selected scale persons. The great difficulty lies in the first step, namely, the selection of appropriate men to represent the scale. Another form of identifying persons with given traits is found in the Character Education Inquiry, 'Guess who test', in which a series of character or personality descriptions is given for hypothetical individuals, and the pupils in a class are asked to write under each description the name of any classmate who seems to them to represent such a type of person.

Rating scales are also used for testing the validity of many objective instruments like paper-pencil inventories of personality.

They are also employed for school appraisal including appraisal of courses, practices and programmes.

The rating scales are advantageous in several other ways, that is they are :

(*i*) helpful in writing reports to parents.

(*ii*) helpful in filling out admission blanks for colleges.

(*iii*) helpful in finding out student needs.

(*iv*) helpful in making recommendations to employers.

(*v*) helpful in supplementing other sources of understanding about the child, and

(*vi*) helpful in their stimulating effect upon the individuals who are rated.

Types of Rating Scales

1. **Descriptive Rating.** The rater puts a check (√) in the blank before the characteristic or trait which is described in a phrase. In order to judge the pupil's initiative, for example, the rater may be asked to tick mark the most befitting description out of the following :

———Shows marked originality

———Willing to take initiative.

———Quite inventive.

———On the whole unenterprising.

———Very dependent on others.

2. **Numerical Scale.** Here numbers are assigned along a continuum or a straight line to judge the intensity of any trait. If it is a seven-point scale, the number 7 represents the maximum amount of that trait in the individual being rated, 4 represents the average amount and so on.

3. **The Graphic Scale.** This is similar to the descriptive scale, except that it is written in a different way. It is also called 'Behavioural Statement Scale.' It may be arranged in two ways. One is the Simple Scale, like, for example :

Responsibility for duty

Very High	High	Average	Low	Very Low

The second is like this,

Social Attitude

Anti Social	Self-Centred	Has no positive attitude	Usually considerate of others	Strongly altruistic

4. **The Percentage of Group Scale.** Here the rater is asked to give the percentage of the group that possesses the trait on which the individual is rated. For example, for rating the honesty of an individual, the rater may check one of the following :

———Falls in the top 1 per cent

———Falls in the top 10% but not in the top 1%

———Falls in the top 25% but not in the top 10%

———Falls in the top 50% but not in the top 25%

———Falls in the lower half, but not in the bottom 25%

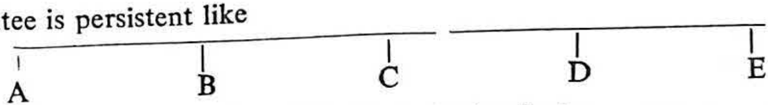
———Falls in the bottom 25%, but not in the bottom 10%

———Falls in the bottom 10% but not in the bottom 1%

———Falls in the bottom 1%.

5. **Man to Man Scale.** The rater is asked to rate the ratee by comparing him to the person mentioned on the Scale and assign the ratee his position. For example A, B, C, D and E are the persons who have been already rated as very persistent, not easily stopped, works quite steadily, somewhat changeable, gives up easily and for example,

the ratee is persistent like



Hints on the construcion and use of Rating Scales

1. Define several points on each scale with as great precision as possible.

2. The specific trait or mode of behaviour must be defined properly. The traits like honesty, initiative, orginality need to be defined.

3. The usual way to get qualitative-cum-quantitative judgements on the selected aspects of a thing or person is to set up three to seven categories. The rater should clearly know that he is rating at a three, four, five or seven point scale.

4. The trait to be rated should be readily observable.

5. Avoid words such as average in the middle range of the scale. The rater who does not wish to give too much effort to the rating procedure is likely to class too many as average.

6. The number of characteristics to be rated should be limited.

7. The directions should be clear and comprehensive. Also indicate the need for honest rating.

8. Items may be arranged in ascending or descending order from left to right.

9. Well informed and experienced persons should be selected for rating. Their number should be large to increase the reliability of any scale.

10. In the rating scale card, some space may be provided for the rater to write some supplementary material.

Limitations of Rating Scale

The rating scales suffer from many errors and limitations :

1. *Generosity Error*. The raters would not like to run down their own people by giving them low ratings. The result is that high ratings are given in almost all cases. It has been verified that 60% to 80% of an unselected group tend to receive above-average ratings in all traits. The raters are also inclined to be unduly generous in rating aspects which they have had no opportunity to observe.

2. *The Halo Error*. It is difficult for rater to get rid of the halo effect which causes him to carry qualitative judgement from one aspect to another. For example, one tends to rate a person with a pleasing personality high on traits like initiative, loyalty also. Halo effect appears frequently when the rater has to rate a number of factors on some of which he has no evidence for judgement.

3. *The Error of Central Tendency*. There is a tendency in some

observers to rate most of the ratees near the mid point of the scale. They would like to put most of the ratees as average.

4. *Stringency Error*. The opposite of generosity error may be called stringency error. Some raters are so cautious and hesitant that they have a tendency to rate all individuals low.

5. *The Logical Error*. It is difficult to convey to the rater just what quality one wishes him to evaluate. An adjective or adverb may have no universal meaning.

ATTITUDE SCALES

Attitude scales have been designed to measure attitudes of a subject or group of subjects towards issues, institutions and groups of people.

The term attitude has been defined in various ways, such as :

L.L. Bernard—"The behaviour which we define as attitudinal or attitude is a certain observable 'set' organism or relative tendency preparatory to and indicative of more complete adjustment."

Barr, David, Johnson—"An attitude may be defined as a learned emotional response set for or against something.

Attitude is a bipolar dispositional complex which, for the purposes of measurement, may be regarded as located on an intensity gradient ranging from extreme disapprobation to hearty approval in respect of a particular object, social institution or practice or a corresponding proposition, *e.g.* regarding tobacco or alcohol, the dowry system, begging, communism, the U.N.O., teacher training, caste system, religion, capital punishment.

An attitude is spoken of as a tendency of an individual to react in a certain way towards a particular object, stimulus, situation, process or phenomenon.

Attitude is what a person feels or believes in. It is the inner feeling of an individual. It may be either positive, neutral or negative.

Attitude-objects may be extremely general, as in the case of an attitude relating to conservatism or liberalism, or extremely specific as in the case of one's attitude concerning vaccination.

Opinion and attitude are used in a more or less synonymous manner by many writers. But there is some subtle difference between the two. An opinion is just an expressed attitude. An opinion may not lead to any kind of activity in a particular direction. But an attitude compels the individuals to act either favourably or unfavourably according to what they perceive to be correct. How people feel or what they believe is their attitude. But it is difficult to specify and describe and ultimately measure the feeling or belief known as attitude. Researchers must depend upon what people say are their beliefs and feelings. This is the area of opinion. Through the use of questions or by getting people's reactions to statements, a sample of their opinions is obtained. From this statement of opinion, one may infer or estimate their attitudes.

The process of inferring attitude from expressed opinion has many limitations. People may conceal their attitude and express only socially acceptable opinions. They may not really know how they feel about an issue, they may never have given the idea serious consideration. People may be unaware of their attitudes about a situation in the abstract. Until confronted with a real situation, they may be unable to predict their reaction or behaviour. Even behaviour itself is not always a true indication of attitude. When politicians kiss babies, their behaviour may not be a true expression of affection towards infants. Social custom or desire for social approval makes many overt expressions of behaviour mere formalities, quite unrelated to people's inward feelings. Even though there is no sure method of describing and measuring attitude, the description and measurement of opinion may be closely related to people's real feelings or attitudes. Real attitude may still remain concealed and the people may provide expressions of socially acceptable opinions only. Expressed opinions or even overt behaviour may be quite unrelated or even opposite to the real attitude.

Under the assumption that description and measurement of opinion is closely related to the real feelings or attitude, some methods have been devised and used to measure attitudes. Some of these methods are :

1. Asking the individual directly how he feels about a subject through the use of a schedule, questionnaire or interview.

2. Asking the individual to check the statements in a list with which he is in agreement.

3. Asking the individual to indicate the degree of his agreement or disagreement with a series of statements about a controversial subject.

4. Inferring an individual's attitude from his reaction to projective devices through which he may reveal his attitude unconsciously.

One approach to the evaluation of attitudes has been through the use of questionnaries. Lists of operational statements are assembled, and the individual whose attitude is being evaluated is asked to record his probable reaction towards the various types of behaviours proposed. Each statement is pointed to one extreme or the other of the attitude that is being appraised. A wide variety of situations may be presented. It is possible in many cases to prevent the individual from detecting the nature of the attitude which is being evaluated. A 'yes' or 'no' response, however, may afford little opportunity for the individual to record the intensity of his beliefs. The questionnaire is no doubt relatively easy to construct but is ill-adapted for scaling accurately the intensity of an attitude.

The scale-type instrument attempts to minimize this difficulty by defining the attitude in terms of a single attitude-object. All items, therefore, may be constructed with gradations of favour or disfavour, thus enabling the individual to register the extent of his attitude. Each item is evaluated by consensus of opinion as to its bearing upon the attitude and is assigned a score value.

Several other types of scales have been constructed. One of these makes possible the measurement of intensity by use of items referring specifically to the degree to which an attitude is accepted or rejected. An individual may check items giving his strong, average or weak approvals. Indirect methods of evaluating attitude tend, however, to be more accurate than direct methods in determining the direction and intensity of an attitude. Techniques which disguise the attitude object and thus elicit spontaneous reactions are preferable to direct questions. Determination of scientifically usable scale values based on psychophysical methods has been found helpful. Chief characteristics of a good attitude scale are given below :

Characteristics

1. It provides for quantitative measure on a uni-dimensional scale of continuum.

2. It uses statements from the extreme positive position to extreme negative position.

3. It generally uses a five-point scale as :

Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD). The individual gets the score as the sum of item credits.

4. Or, it may require the judges to pile up the given statements and compute the scale values according to the percentage of judges who place each statement in the different categories. It gives the individual a score on the basis of the median scale values of the statements he has endorsed.

5. It is usually standardized and norms are worked out.

6. It disguises the attitude object rather than directly asking about the attitude on the subject.

Purposes

It will be useful at this stage to know the purposes of attitude scales. In educational research, these scales are used especially for finding the attitudes of persons on issues like co-education, religious education, corporal punishment, democracy in schools, linguistic prejudices, international cooperation, etc. depending upon the need of the situation.

SOME ATTITUDE SCALES

Two popular and useful methods of measuring attitudes indirectly, commonly used for research purposes are the *Thurstone Technique of Scaled Values* and *Likert's Method of Summated Ratings*. Some others are Guttman's Scale Analysis, Coomb's Unfolding Technique and Lazarsfeld's Latent Structure. A brief description of these is given below :

Thurstone Technique

If attitude is accepted as a uni dimensional linear continuum, then Thurstone's proposal to measure it by statements scaled by the method of equal-appearing intervals would apply. The procedure is fairly simple. A large number of statements of various shades of favourable and unfavourable opinions on the issue under investigation are written down on slips of paper, which a large number of judges exercising complete detachment sort out into *eleven* piles ranging from the most hostile statements to the most favourable ones. The opinions are carefully worded so as to be clear and unequivocal. The judges are asked not to express their opinion but to sort them at their face value. The items which bring out a marked disagreement between the judges in assigning a position are discarded. Tabulations are made which indicate the number of judges who placed each item in each category. The next step consists of calculating cumulated proportions for each item and ogives are constructed. Scale values of each item are read from the ogives, the values of each item being that point along the base line in terms of scale value units above and below which 50% of the judges placed the item. It will be the median of the frequency distribution in which the scores range from 0 to 11.

Sample Items from Thurstone Type Scales

Statement	*Scaled Value*
I think this company treats its employees better than any other company does.	10·4
If I had to do it over again I'd still work for this company.	9·5
The workers put as much over on the company as the company puts over on them.	5·1
You've got to have pull with certain people around here to get ahead.	2·1
An honest man fails in this company.	0·8

The respondent is to give his reaction to each statement by endorsing or rejecting it. The median values of the statements that he checks establishes his score, or quantifies his opinion. He wins a score as an average of the sum of the values of the statemen's he endorses.

Thurstone's technique is also known as the technique of equal-appearing intervals.

The Likert Scale

The Likert scale uses items worded for or against the proposition, with five-point rating response indicating the strength of the respondent's approval or disapproval of the statement. This method removes the necessity of submitting items to the judges for working out scaled values for each item. It yields scores very similiar to those obtained from the Thustone scale. It is considered an improvement over the Thurstone method.

The first step is the collection of a number of statements about the subject in question. Statements may or may not be correct but they must be representative of opinion held by a substantial number of people. They must express definite favourableness or unfavourableness to a particular point of view. The number of favourable and unfavourable statements should be approximately equal. A trial test may be administered to a number of subjects. Only those items that correlate with the total test should be retained.

The Likert scaling technique assigns a scale value to each of the five responses. All favourable statements are scored from the maximum to minimum, *i.e.* from a score of 5 to a score of one or 5 for strongly agree and so on 1 for strongly disagree. The statements opposing the proposition would be scored in the opposite order *i.e.* from a score of 1 to a score of 5 or 1 for strongly agree and so on 5 for strongly disagree.

The total of these scores on all the items measures a respondent's favourableness towards the subject in question. If a scale consists of 30 items, say, the following score values will be of interest.

30 × 5 = 150	Most favourable responses possible.
30 × 3 = 90	A neutral attitude.
30 × 1 = 30	Most unfavourable attitude.

It is thus known as a method of summated ratings. The summed up score of any individual would fall between 30 and 150. Scores above 90 will indicate a favourable and scores below 90 an unfavourable attitude.

Sample Items from Likert Type Minnesota Scale on Morale

Responses					*Items*
SA	A	U	D	SD	Times are getting better.
SA	A	U	D	SD	Any man with ability and willingness to work hard has a good chance of being successful.
SA	A	U	D	SD	Life is just a series of disappointments.
SA	A	U	D	SD	It is great to be living in these exciting times.
SA	A	U	D	SD	Success is more dependent on luck than on real ability.

Guttman's Scale Analysis

Guttman, an extremely original worker offered a criticism of the above type of scales from which he educed certain original principles of scaling. The scales so far considered, permit a person to endosre a severe opinion and refrain from endorsing a mild one. Is it logical for a person to agree with 'Prohibition is the greatest single promoter of happiness in a civilized society' and withhold agreement with 'Prohibition will prevent the break-up of many a family'? If the first statement occupies a higher scale status than the second, should it not contain, assent to the first as a precondition of its endorsement? Is it a logical scale of distance that a yard does not include a foot? Guttman brought up this pertinent criticism in 1942 and subsequently proposed a form of scaling known as scale analysis which really is a procedure for devising a scale calculated to be uni-dimensional and such as would lead us back from the total value to the pattern of responses. The index of reproducibility shows to what extent the principle of a stronger opinion including and lying beyond the weaker is honoured by any ordered string of statements. If reproducibility is low and there is reversal of endorsements on statements of low and high value, many of the conditions of scalability of the area are not met. The technique of scalogram analysis sorts out statements which yield a reproducible scale and has been described completely by him. It is felt that the logical foundations of the Guttman technique are correct and unbiased scientific effort should be directed to use the Guttman rationale for future developments of a constructive nature in the field of attitude measurement.

Coomb's Unfolding Technique

Under the Thurstone method judges are required to allocate statements into 11 piles from the point of view of their strength. The personal attitude on the question is not allowed to affect the judgement. That much detachment is possible is a demonstrable fact. It has however been contended that one's own status on the attitude scale is likely to colour one's judgements. It would be more natural to judge every statement for its severity or favourableness from one's habitual status on the attitude continuum. Coombs has developed the rationale of an 'unfolding technique' which bestows on the respondent the central status in the process of judging. Every person is required under this method to rank the statements in the order of their distance from his point of view. A median status person will give a low rank to extreme statements irrespective of directions. Thus he becomes the hinge and the scale extending on both sides of him a folding tape.

Lazarsfeld's Latent Structure

His latent structure analysis is a general mathematical formulation which incorporates within itself Guttman's idea of unidimensionality and relates it to the theory of factor analytic extraction of underlying uniformity which constitutes a genuinely scalable variable. In factorising tests we derive common factors which explain the intercorrelations of tests. Lazarsfeld is also interested in intercorrelations of items of attitude scales. The Spearman view of factors holds that tests correlate because of an underlying common element called *g*. In this conceptual frame the actual test is a mass of heterogeneous elements and the *g* the pure, unidimensional and scalable variable. Lazarsfeld applies these factorial criteria to the attitude area.

The research student will have now appreciated how varied are the approaches to the single problem of scaling of stimuli. All the methods briefly summarized here are of the utmost importance in the scientific type of research.

Limitations of Attitude Scales

1. As already stated, an individual may express socially aeceptable opinions and conceal his real attitude.

2. An individual may not be a good judge of himself and may not be clearly aware of his real attitude.

3. He may not have been confronted with a real situation to discover what his real attitude towards a specific phenomenon was.

4. There is no basis for believing that the five positions indicated in the Likert scale e.g. are equally spaced.

5. It is unlikely that the statements are of equal value in 'forness' or 'againstness'.

6. It is doubtful whether equal scores obtained by several individuals would indicate equal favourableness towards a given position. Different combinations of positions can yield equal score values without necessarily indicating equivalent positions of attitude or opinion.

7. It is unlikely that a respondent can validly react to a short statement on a printed form in the absence of real life-qualifying situation.

8. Inspite of anonymity of response, individuals tend to respond according to what they should feel rather than what they really feel.

However, until more precise measures are developed, the attitude scales remain the best devices for the purpose of measuring attitudes and beliefs in social research. They determine the direction and intensity of a person's feelings for or against some belief or practice. They are used to measure any changes in attitude which may result from factors introduced purposely or occurring independently.

SCORE CARDS

Score card is the most elaborate form of rating instrument often called a numerical rating scale. There is no sharp dividing line between rating scales and score cards. In score card the items are evaluated usually in numerical terms. The typical score card provides for more aspects of the object to be rated and has a definite number of points to be allotted to each item. A rating scale has fewer characteristics and uses a variety of different means of scaling, some of which are quite indefinite. Further, a rating scale may have descriptions of various degrees of each trait, a score card may have general standards or criteria, printed separately and describing only a satisfactory or ideal level. The score card differs from the check-list primarily on calling for an evaluation of each aspect rather than noting merely its presence or absence.

The most common application of the score card has been in the field of rating school buildings. It is also employed in evaluating communities, building-sites, textbooks, schools, socio-economic status of a family and the worth of any literary or educational work or institution. The rater is provided with a general standard of criteria in detail and he has to react to and rate only a single unit of the total situation at a time. Usually a number of raters are employed and their scores combined and averaged. Clark's score card for the school budget, Strayer and Engelhardt's score card for school records and reports, Proctor's score card for guidance, Moehlman's score cards for publicity material and for parent-teacher association illustrate other applications of score cards to administrative problems.

Score cards suffer from some limitations and difficulties which are similar to those of rating scales. It is difficult to choose, identify and quantify the significant aspect of the factors to be observed. Besides there is the suspicion that the whole of a thing may be greater than the sum of its parts. Certain important aspects never lend themselves to score-card ratings.

The characteristics of a score-card and the best techniques for constructing one, must vary with the field and purpose of the evaluation or investigation in hand.

INDEX NUMBERS

In the desire to make complex comparisons as objective as possible, educators have often turned to the use of index numbers. These represent a particular form of analyzing quantitative data which can be gathered by one means or another. Index numbers do not necessarily depend for their basic figures on judgement at all. After the respective weighting of charactersistics has been decided upon, the rest of the procedure is usually objective.

An index number is essentially an average. It combines in one figure the average of a number of different factors (variable elements). The technique is, therefore, applicable when it is desired to represent in a single figure the average status of a number of factors, each expressed as a variation from a particular set of values that has been accepted as a base.

Index numbers have been applied to a number of phases of education, most of which are administrative. Most ambitious of these applications have been the attempts to rate the educational activities of the various states. Indexes for the United States as a whole were printed for each of the forty-eight years from 1871 to 1918. The index was based upon ten items of information taken from the statistical reports of the United States Office of Education. These items or factors, read : "Percent of school population attending school daily", "Average number of days schools were kept open," "Average expenditure per child", "Expenditure per teacher employed, for salaries," etc.

Index numbers were originally constructed to determine changes in prices of commodities. They cover the cost of living, wholesale prices and retail prices. The index numbers dealing with cost of living are perhaps the most widely known in educational circles. They are available separately for each of the six groups of commodities, namely, food, clothing, housing, fuel and light, house furnishings and miscellaneous. These various index numbers of economic conditions have been used in a variety of research studies in education, both as patterns of analysis and as direct sources of information. Index numbers for the cost of living have been used to show variations in purchasing power of teacher's salaries. Several cost-of-living index numbers have been constructed especially for teachers to reflect variations in costs from year to year or from place the place.

While constructing index numbers, one has first to select factors (items) for his index number which will represent as faithfully and completely as possible the general characteristic which he desires to study. The selection of items to represent complex concepts like cost of living, general business conditions or the efficiency of school systems calls for a thoughtful analysis of the concept. Proper weighing is a second element in representing the characteristic one desires to study.

The problem of putting the data together and performing the statistical calculations, after the above aspects have been given due atttention, is a technical one. Various statistical tests provide us with the suitable formula for index numbers.

* * *

SIXTEEN

Experimental Method

Undoubtedly, experimentation is the most scientifically sophisticated research method. It is defined as observation under controlled conditions. It studies observable changes that take place in order to establish a cause and effect relationship. It is the description and analysis of what will be, what will occur or what can be made to occur under carefully controlled conditions. Experimentation consists in the deliberate and controlled modification of the conditions determining an event, and in the observation and interpretation of the changes that occur in the event itself.

Experimental research provides a sytematic and logical method for answering the question, "If this is done under carefully controlled conditions, what will happen ?" Experimenters deliberately and systetically manipulate certain stimuli, treatments or environmental conditions and observe how the condition or behaviour of the subject is affected or changed. They are also aware of other factors that could influence the outcome and remove or control them in such a way that they can establish a logical association between manipulated factors and observed efiects. When one engages in experimental research, one does not merely describe a condition, determine the status of something, or chronicle past events. Instead of confining activities to observing and describing *what* exists, one deliberately manipulates certain factors under highly controlled conditions to ascertain *how* and *why* a particular condition or event occurs.

Experimentation is therefore, the name given to the type of educational research in which the investigator controls the educative factors to which a child or group of children is subjected during the period of inquiry and observes the resulting achievement. He must start the experiment with some measurement of the initial attainment of the children in the trait or ability to be influenced. He then subjects the group to the experimental factor, such as the particular type of drill material in arithmetic, for the duration of the experiment. At the end, he applies a final test for the purpose of determining the gain in achievement that has resulted from the application of the experimental factor.

Experimentation is the classic method of the science laboratory, where elements manipulated and effects observed can be controlled. It has been effectively applied within non-laboratory settings such as the classroom, where significant factors or variables can be controlled to some degree. In educational research, experimental method is the application and adaptation of the classical method of the science laboratory.

BASES OF EXPERIMENTAL METHOD

Experiment is rightly described as 'a question put to nature', the answer to which may be yes, no or an evasion. A good experimental set-up will minimize the scope for evasion.

Creditable experimental method has to do with controlled observation of change and development. Adequate control is the essential factor of the method used. The law of the single variable must be satisfied in every experimental situation. The great rule is to vary only one circumstance at a time, and to maintain all other circumstances rigidly unchaged.

The law of the single variable formulated by J.S. Mill is the basic assumption behind the experimentation. The law states that if two situations are similar in every respect, and one element is added to or subtracted from situations are one but not the other, any difference that develops is the result of the operation of that element added or subtracted.

Mill's Canons of Experimental Inquiry. John Stuart Mill further gives in all five modes of discovering and verifying laws of nature. These he calls canons or rules. They are reproduced below :

(*i*) *Method of Agreement*—If two or more instances of the phenomenon under investigation have only one circumstance in common, the circumstance in which alone all the instances agree is the cause (or effect) of the given phenomenon. Stated otherwise, if two cases possess a common characteristic and on examination are found to be totally dissimilar except for one fact, there is some relationship between the observed fact and the common characteristic.

(2) *Method of Difference*. If an instance in which the phenomenon under investigation occurs, and an instance in which it does not occur, have every circumstance save one in common, that one occuring only in the former, the circumstance in which alone the two instances differ, is the effect, or cause, or a necessary part of the cause, of the phenomenon. That is if two cases differ in respect of some fact, and are found to be similar in all respects except one single characteristic or condition, we conclude that the condition is related to the fact in which alone the cases differed.

(3) *The Joint Method of Agreement and Difference*. If two or more instances in which the phenomenon occurs have only one circumstance in common, while two or more instances in which it does not occur have nothing in common save the absence of that circumstance ;

the circumstance in which alone the two sets of instances differ, is the effect, or cause, or a necessary part of the cause of the phenomenon. Consider two guinea pigs which are dead and only the single fact in common of having eaten a brand of feed ; and two other guinea pigs who survive and have nothing in common except the fact that they were not given the particular brand of feed. The conclusion obviously is that the feed is fatal for some reason to guinea pigs of all kinds.

(4) *Methods of Residues.* Subduct from any phenomenon such part as is known by previous inductions to be the effect of certain antecedents, and the residue of the phenomenon is the effect of the remaining antecedent. It states that if we eliminate all effects due to known causes the remaining effects can be attributed to residual antecedents.

(5) *Method of Concomitant Variations.* Whatever phenomenon varies in any manner whenever another phenomenon varies in some particular manner, is either a cause or an effect of that phenomenon, or is connected with it through some fact of causation. It merely confirms a link between quantities which vary together directly or inversely.

Experimental research starts where any inquiry starts, namely, with the identification and rigorous analysis of the problem. The issues involved in the problem are sharpened by formulating hypotheses and ascertaining the consequences that are logically implied by them. A test is then devised to ascertain whether the consequences that should occur if the hypotheses are to be confirmed are actually observable.

INDEPENDENT AND DEPENDENT VARIABLES

If a hypothesis and its deduced consequences are well conceived, two factors are precisely identified :

(1) an independent variable, and

(2) a dependent variable.

A hypothesis suggests that an antecedent condition (independent variable) causes another condition, event, or effect (dependent variable) to occur. Some investigators apply different names to these factors, such as

(1) cause and (2) effect,

(1) stimulus and (2) response,

(1) antecedent and (2) consequent

(1) experimental variable and (2) behaviour variable, and

(1) treatment and (2) effect.

Variables are the conditions or characteristics that the experimenter manipulates, controls or observes. The *independent* variables are the conditions that the experimenter manipulates in his attempt to ascertain their relationship to observed phenomena. The *dependent* variables are the conditions that appear, disappear or change as the experimenter introduces, removes or changes independent variables.

The experimenter constructs an experiment in which he attempts to control all conditions except the independent variable which he manipulates.

In educational research an independent variable may be a particular teaching method, a type of teaching material, a reward, or a period of exposure to a particular condition. The dependent variable may be a test score, the number of errors, or speed in performing a task. Thus, the dependent variables are the measured changes in pupil performance attributable to the influence of the independent variables.

Organismic or Attribule Variables. Organismic variables are those characteristics that cannot be altered by the experimenter. Such independent variables as age, sex, or race have already been determined, but they can be introduced or removed as variables. The question of whether seven-year-old girls show greater reading achievement than seven-year-old boys provides an example of sex as an organismic variable. The teaching procedure is the same for each group. Sex, being an organismic variable, is not manipulated, it has already been determined.

Intervening Variables. In many types of behavioural research the relationship between the independent and dependent variables is not a simple one of stimulus to response. Certain variables which cannot be controlled or measured directly may have a significant effect on the outcome. These modifying variables intervene between the cause and the effect.

For example, a language teacher is interested in determining the effect of immediate reinforcement upon learning the parts of speech. He suspects that certain factors or variables may influence the relationship, even though they cannot be observed directly. Motivation, fatigue, anxiety, for example, are some of the intervening variables which are difficult to define in operational terms. These intervening variables cannot however be ignored and they have to be accouted for in some way.

Extraneous Variables. Extraneous variables are those uncontrolled variables or variables not manipulated by the experimenter that may have a significant influence upon the dependent variable. Many research conclusions are invalidated by the influence of these extraneous variables.

In a study, the effectiveness of three different methods of social studies teaching was compared. Intact classes were used. but the researchers were unable to rendomize or control such variables as teacher competence or enthusiasm, or the age, socioeconomic status, or academic ability of the students. The criterion of effectiveness was achievement measured by scores on standardized tests. It would seem clear that the many extraneous variables precluded valid conclusions about the relative effectiveness of the independent variables.

Although it is almost impossible to eliminate all extraneous variables, particularly in classroom research, sound experimental design enables the researcher to largely neutralize their influence.

CONTROL OF THE EXPERIMENT

Experimentation is not merely a little game of manipulating one variable to see what happens to another variable. It consists in *controlled observation*. The most important task that the researcher faces in an experiment is to achieve control over all factors that affect the dependent variable. Unless he identifies and controls them, he can never be certain whether it is the manipulation of the independent variable or some other factor that has caused the particular effect.

The quality of an experiment is determined largely by the extent to which rigid controls are introduced. Some investigators test vaguely stated hypotheses without trying to identify and control the factors that influence the dependent variable but their studies are not acceptable as scientific experiments. Achieving adequate control of the variables is extremely difficult because of the complex nature of educational phenomena, but the competent experimenters strive to construct research designs that will give the greatest measure of control over them.

But how does a researcher determine what variables affect his dependent variable? Previous experience with the phenomena and a careful analysis of the problem will undoubtedly suggest some clues. The findings of one's predecessors provide the richest source of information concerning what variables it is essential to control in an experiment.

One of the biggest mistakes a researcher can make is to rush into the construction of an experimental design before he has adequate knowledge of the relevant factors that he must control.

Types of factors to be controlled. In general, there are three types of factors to be controlled in an experiment: (1) those arising from the population, (2) those stemming from the experimental procedures and (3) those exerting influences from external sources.

Population Variables. Sometimes the manipulation of the independent variable appears to cause a given effect on the dependent variable when it is actually the character of the participating subjects that is responsible. These are the organismic or attribute variables described elsewhere. The researcher must analyze whether there is any characteristic about the subjects that could affect the dependent variable, such as intelligence, age, sex, physical or emotional status, or previous educational, home or cultural experiences,

Variables due to Experimental Procedures. The experimental procedures themselves may affect the dependent variable. Suppose that an investigator wants to determine whether children will acquire greater mastery of fractions if taught by the drill or comprehension method. He may take the precaution of selecting two groups of subjects who are alike in all respects so that differences in their nature cannot affect the results. But if he fails to control his procedures, the procedural differences may influence the group's gain in achievement. These procedural differences arise if he does not give the two groups the same total amount of practice, does not use lesson plans that are equally interesting, does not select subject matter that is equally suitable for teaching by either method or does not administer tests of mastery that are equally fair for evaluating both methods of instruction. The length of the experiment may also produce variations in the results obtained. It is conceivable that the drill method could produce greater gains than the understanding method over a brief period of time and exhibit greater losses over an extended period of time. On the other hand, the understanding method could show smaller initial gains, but less forgetting over a longer time interval.

Experimental procedures may also introduce unconscious signalling which will influence the results obtained. The subjects may receive clues from the behaviour of the experimenter or from the nature of the tools, tests employed that enable them to guess what hypothesis is being tested or to suspect the significance of their responses. Anything that tips off the subjects to the purpose of the study may distort their normal responses to the experimental variable. If the same experimenter judges the performance of two or more groups in succession or the same subjects before and after the application of the experimental variable, his judgements may vary because he becomes more fatigued, more discriminating or more experienced.

Sometimes the experimental procedures generate a variable that alters a subject's responses to the independent variable. Because of the practice received through more than one exposure to a test or independent variable or because of the order in which stimuli are presented to him, a subject may acquire skill, develop speed or even lose receptivity to a stimulus. If a pretest is given in an experiment, it may actually serve as a learning experience which enables the subject to do better on the final test whether or not an experimental factor is applied.

External Influences. These are synonymous with extraneous variables discussed elsewhere. The external influences that impinge upon the situation may have an effect on the dependent variable. In an experiment, one group of students may have been taught in a much noisier room or at a less favourable hour of the day than the other. The teacher presenting one method may have been more proficient than the one employing the other method. If the same teacher taught both groups, he may have been more enthusiastic about one method than the other. A student in one group may have been a trouble-maker or a dynamic leader who motivated the whole group to do poorer or better work than they would normally do.

PURPOSES OF CONTROL

In an experiment, the experimenter seeks to control variables for the following purposes :

(1) to isolate the determiners individually and in combinations,

(2) to vary them as magnitudes either singly or in combinations, and

(3) to describe quantitatively the extent of their expression and their interacting effects.

Achieving Isolation. To prevent a factor other than the independent variable from affecting the dependent variable, the researcher may remove the unwanted or interfering variable or keep constant its effect. Thus, in an experiment involving touch, taste, or smell discrimination, the researcher may blindfold the subjects so that the unwanted visual stimuli do not affect what the subjects report they touch, taste or smell. Often it is not possible to remove unwanted variables before applying the independent variable. Age, for instance, is a variable that affects many dependent variables. Since all subjects possess an age, a researcher cannot eliminate it. But one control that is available to him is to maintain constancy of condition by selecting subjects of the same age.

Achieving Changes in Magnitude. An investigator may strive not only to isolate the independent variable, but also to ascertain how much effect it contributes. To achive this, be must be able to vary the magnitude of the experimental variable. For example, he may make observations for each degree of change in the independent variable—intensity pitch, or timbre of an auditory stimulus to determine its effect on the dependent variable.

Achieving Quantitative Evaluation. The ultimate goal of a researcher is to express the magnitude of the variable in quantitative terms. He does not merely want to know that one expression of a variable is larger or smaller than another, but, precisely how much larger or smaller it is. If two variables are functionally related, he does not merely want to state that they are positively related, but rather to know the specific degree of relationship in terms of some numerical value.

METHODS OF CONTROL

Researchers have devised a number of procedures to control variables.

Removing the variable. Variables may be controlled by eliminating them completely. Observer distraction may be removed by separating the observer from the observed by a one-way glass partition. Some variables between subjects may be eliminated by selecting cases with uniform characteristics. Using only female subjects removes sex as a variable.

Physical Manipulation. Various means of physical manipulation may be employed so as : (1) to give all subjects the same exposure to the independent variable or (2) to control non-experimental variables that affect the dependent variable.

As mentioned above, total elimination of the variable is one such physical manipulation. A *mechanical means* may be devised for the purpose ; an experimenter may soundproof or lightproof a room to screen out unwanted stimuli ; use a one-way screen for observation ; employ a tachistoscope to present each subject with a specific number of words, numbers, pictures for brief intervals of duration or construct a maze to study an ability to learn. *Electrical means* can also be employed to effect control ; an investigator may utilize constant-speed motors for driving various types of apparatus such as the memory drum. *Surgical means* can also be employed to effect control : an experimenter may remove glands from the body or destroy tissue to certain parts of the brain to determine their effects on behaviour. *Pharmacological means*, such as changes of diet, drugs or gland extracts can also be used to achieve control.

Selective Manipulation. Some variables cannot be controlled by direct physical manipulation but can be by rigorous indirect manipulation. One may effect control of variables through the *selection of materials*. In a study concerning the amount of time required to memorise materials of different lengths, the shorter units of material may be more difficult than longer units. This condition may affect the amount of time required to master them. Hence the experimenter controls the unwanted factor of difficulty by selecting short and long learning units that are comparable in difficulty.

Through the *selection of subjects* it is often possible to manipulate indirectly variables that cannot be controlled by direct physical means. If one wants to know, for example, whether method inductive or deductive is the better way of teaching a particular subject, a number of things besides the method may affect the final achievement. If the more intelligent pupils constitute one group, one cannot assume that these subjects have achieved better than the other group because of the teaching method. To gain control over this unwanted factor of intelligence, subjects of equal intelligence can be paired and randomly assigned one student of each pair to each group. In a similar manner, control can be achieved over other unwanted factors, such as age, interests, attitudes, socioeconomic status, religion, amount of education or previous experiences that might produce variation in results.

Sometimes it is not possible to set up laboratory experiments in which conditions can be physically manipulated to observe their effects on human beings. Consquently, the resercher must attempt to gain control through the *selection of data*. Manipulating variables to see whether they cause suicides or juvenile crimes, for example, cannot be permitted. But one might be able to select primary data from records of institutions and governmental agencies that can provide information needed for studying factors contributing to such behaviour.

Statistical Manipulation. When variables are not amenable to physical or selective manipulation, they may be controlled by statistical techniques. These techniques are particularly useful in situations where multiple variables may be causing a particular effect, as is often the case in social sciences.

If we cannot match the students by pairs—that is by assigning one student of each pair to each group, we can do so by matching the groups of students. Here the subjects are assigned to experimental and control groups in such a way that the means and the variances of the groups are as nearly equal as possible.

In classical experimentation isolating and varying one variable at a time to study its effect on the dependent variable was considered an essential rule. But, if one does this when working with complex educational phenomena, he may prevent or ignore the simultaneous functioning of variables with which the experimental variable interacts in normal situations. To overcome this difficulty, he can study a number of variables operating together and afterwards apply statistical techniques to isolate and evaluate the effect of each one of the variables. Suppose that variables A, B and C act conjointly on dependent variable X. If only the relationship between A and X is obtained, the findings are spurious, because A is partly a product of its interaction with B and C. Thus we may adopt method of *partial correlation* to hold B and C constant to determine the precise relationship between A and X.

Analysis of covariance permits the experimenter to eliminate initial differences on several variables between the experimental and control groups. Using pretest mean scores as covariates, this method is considered preferable to the conventional matching of groups.

Randomization. Randomization involves pure chance selection and assignment of subjects to experimental and control groups from the available supply of subjects. If two groups are involved, randomization could be achieved by tossing a coin. When more than two groups are involved, dice or a table of random numbers could be used.

Randomization provides the most effective method of eliminating systematic bias and of minimizing the effect of extraneous variables. The principle is based upon the assumption that through random assignment, differences between groups result only from the operation of probability or chance. These differences are known as sampling error or error variance, and their magnitude can be estimated by the researcher.

TYPES OF EXPERIMENTS

Experimental method takes various forms. The most important and commonly used forms are being discussed below :

Laboratory Experiment. The law of the single variable has always provided the basis for laboratory experimentation. In this experiment, the investigator creates a situation with the exact conditions he wanted to have and in which he controls some and manipulates other variables. The major difference between field experiment and laboratory experiment is that of the nature of setting and degree of control. In a laboratory experiment the phenomenon is artificially created and is naturally subjected to greater control and manipulation. Formidable apparatus is the very characteristic of experiments in science. The laboratory is equipped with a view to facilitate a maximum control of conditions to minimise errors.

The laboratory paraphernalia and set-up are met with in psychological experiments also but there is a radical difference between the domains of the physical sciences and of the biological sciences. The object of study in the former is governed by mechanical principles and is characterized by a uniformity of behaviour. The object of study in biological sciences has only a probable uniformity of behaviour and shows variability in reaction in the same object at different times or from object to object. In physical sciences the study of a single case has a good chance of providing laws for a whole class of phenomena. In biological sciences, the fact of intra-person and inter-person variability creates problems of norms and trends the solution of which requires statistics. Experiments in psychology and education therefore use statistics compulsarily as otherwise generalization in them simply cannot be made.

Laboratory experiment provides the chief basis for theorizing, tends to deal with more fundamental processes, may not be concerned with immediate practical problems and may be motivated only by the type of intellectual curiosity which is found in pure chemistry or physics, may utilize a limited number of cases, may establish conditions of an atypical nature in attempting to control variables rigidly, is grounded in the belief that there are constants, universal principles and uniform sequences in human nature.

It can help in the field of education in many ways *e.g.* in laboratory studies of school activities involving skill, diagnosis through the aid of time records, diagnosis through the photographing of eye movements, diagnosis of emotional tension, etc.

An experiment in psychology or education requires notes on day and hour of experiment, name of the subject, his general condition of body and mind, the statement of the problem, brief description of apparatus and material, the method of the experiment, data and its treatment and finally the result leading to a conclusion.

Because of the artificiality of the laboratory setting, any conclusion based on laboratory experiment has to be verified before being implemented or extended to the general population.

Field experiment. Experiments in social sciences like education and psychology have frequently to deal with data which cannot be brought into the laboratory. In field experiments, the data is appraised in the field which is its natural setting.

The field experiment is characteristic of research process in the social sciences, and a number of logical categories of this have been offered. Greenwood mentions the pure, the uncontrolled. the trial and error, the *ex post facto* form of experiment and the controlled observational study. Chaplin divides the field study into three major types : the cross-sectional method which on a given data makes and records observations to be analyzed ; the before-and-after study which means criterion observations being made before and after a treatment so that the effect of the treatment may be evaluated, finally the *ex post facto* type in which present observations are traced backwards through such recorded facts as may be available *e.g.*, the residents of a Borstal Institute may be studied in this manner, when the history of each case may be traced backwards to the first crime and its antecedents.

CHARACTERISTICS OF AN EXPERIMENT

If experimentation is to provide a meaningful solution to a problem, it is essential that the experiment contains, within itself, the means for answering its own questions—*i.e.*, the experiment must be self-contained. This, in turn, calls for the satisfaction of three basic and interrelated conditions—*control, randomization and replication*. Unless these conditions are fulfilled, the experiment cannot be interpreted, because it cannot eliminiate the possibility that the results obtained were caused by factors other than that under investigation.

Control. *Control* is the basic element of experimentation. The experiment must be organized so that the extraneous factors are prevented from operating and confusing the outcome which is to be appraised.

To control the relevant factors is very difficult, especially in the social sciences. This is particularly true in education where one does not violate the principles of good teaching just to carry out an experiment. Furthermore, the number of variables to be controlled—chronological age, intelligence, enthusiasm and motivation, study habits, the time available for study, and so on—is large. There is a limit to the extent to which one can manipulate human beings for experimental purposes and as far as educational research is concerned, it is frequently necessary to compromise between what is administratively feasible and what is scientificially rigorous.

Dangers of Artificiality. Although control is fundamental to experimentation, care must be taken not to control the situation so that it becomes artificial and so that the results, even though highly rigorous are inapplicable and meaningless from the standpoint of the actual situation. The pure scientist would insist that unless control is exercised the results are meaningless since there would be no way of knowing what caused them. To him generalizbility is a more basic concept and replicability has to be sacrificed. The practitioner, on the other hand, would insist on applicability to the real situation, regardless of whether the results can be generalized to any general class of events. He would contend that rigorous results that apply nowhere are automatically useless.

This is the basic issue of *action research*, in which scientific rigour has frequently been sacrificed in order to obtain an answer to a practical problem existing here and now. To the extent that the investigator exercises rigorous control over a situation, he automatically establishes conditions different from those of the regular situation and by that very process alters his problem, and makes it impossible to apply his findings to an actual situation.

Control in Educational Experiments. In classroom teaching experiments, it is particularly difficult to control the enthusiasm and the zeal of the teacher and the motivation which he generates in his students. To the extent that enthusiasm is frequently based on such transient factors as the novelty of the method, the findings concerning the true worth of the methods being compared are invalid.

Another factor that needs to be considered very closely is the nature of the experimental design itself. Occasionally, the experiment is designed in such a way that it can lead to only one conclusion. The criterion against which the outcomes of a given experiment are measured is directly related to the outcomes the experimental method was designed to produce so that the experiment is a success from that stand point—but nothing is said about the price that was paid because of the neglect of other equally desirable objectives.

The Ex-Post-Facto Experiment. Particularly questionable from the standpoint of control is the ex-post-facto experiment which seeks to identify the antecedents of the differences noted in existing groups. This is experimentation in reverse : instead of taking groups that are equivalent and exposing them to different treatment with a view to promoting differences to be measured, the *ex-post-facto* experiment begins with existing groups that are different and attempts to trace the antecedents of these differences. The obvious weakness of such an experiment is that it lacks control over past circumstances and cannot isolate the many conditions that may have been involved.

By their very nature, *ex-post-facto* experiments can provide support for any number of different, and perhaps contradictory hypotheses. If we were to find that unemployed people read more than employed people, we might consider this evidence to support the hypothesis that leisure promotes cultural interests. But, on the other hand, if we were to find they read less, we could suggest as hypothesis that a lack of cultural interest is conducive to unemployment. The point is that these hypotheses are not tested, since one cannot test hypotheses on the same data from which they were derived, the evidence simply illustrates the hypotheses. *Ex-post-facto* experiments are, therefore, better considered as surveys useful in the derivation of hypotheses to be tested through more conventional experimental approaches.

Randomization. Our first goal, then, is to control all relevant factors operating in the situation. Since complete control is impossible, the investigator must attempt to neutralize the effect of whatever factors have not been adequately controlled by assigning the subjects at random to the various groups under comparison. Thus the directional differences caused by uncontrolled factors will tend to cancel one another. As a result, the only errors will be those of a random sampling nature, the magnitude of which can be appraised on the basis of the theory of probability.

Biases due to a failure to randomize the assignment of subjects to the experimental treatments can be found, for instance, in studies of the effectiveness of a remedial reading programme when an attempt is made to select for the programme those pupils who are most likely to profit from it, while the remainder act as a control group.

Replication. One may attempt very carefully to control all the factors that might influence the results on the basis of which the operation of the independent variable is to be appraised. Also the methods and the subjects may be assigned to the experimental and control groups on the basis of the principles of randomization. But still slight discrepancies are bound to remain. These are taken care of through the replication of the study. which is a matter of conducting a number of sub-experiments within the framework of an overall experimental design. Thus rather than comparing a single control case with a single experimental case, the investigator makes a multiple comparison of a number of cases of the control group and a number of cases of the experimental group, all within the same experiment. He might assign equivalent cases in each of the experimental and control groups at random, and consider the comparison of each pair as an experiment in itself. Thus in an experiment involving one hundred cases in each of the experimental and control groups, he is really conducting one hundred parallel experiments in one.

The precision of an experiment involves a balance between *control, randomization and replication.* Randomness is, of course, essential. Without it, directional differences are likely to occur, tbe magnitude and direction of which are beyond interpretation. Assuming randomness, precision becomes a function of the degree of control and the extent of replication. Specifically, the precision of an experiment can be increased either by increasing the number of cases in the comparison groups, or by increasing the homogeneity of the samples through a greater degree of control, thus minimizing the influence of the many variables to which the differences in the outcome might be attributed. This implies that the greater the degree of control, the smaller the sample needed for a given level of precision. In practice, it is therefore a matter of balancing the degree of control that should be exercised against the possibility of relying on a larger number of cases of a somewhat less homogeneous nature.

MAJOR STEPS IN THE EXPERIMENTAL METHOD

The procedures of an experiment are to be executed with the greatest care, otherwise the experimental process becomes valueless. The following list will give a more comprehensive picture of the work one may have to do :

1. **Identifying, defining and delimiting the problem.** The problem should be amenable to experimentation. The variables to be investigated should be defined in operational terms.

2. **Reviewing the literature.** After selecting the problem, the related literature and experiments should be reviewed and the method of approach or the experimental design to be pursued should be planned and outlined.

3. **Formulating hypotheses and deducing their consequences.** The problem has to be converted into a hypothesis or hypotheses that can be verified or refuted by the experimental data.

4. **Drawing up the Experimental Design.** This section should place primary emphasis on the questions of control, randomization, replication, place of the experiment, duration of the experiment, selecting or constructing and validating instruments to measure the outcomes of the experiment, and conducting pilot or trial run tests to perfect instruments or design.

5. **Defining the Population.** It is necessary to define the population precisely so that there can be no question about the population to which the conclusions are to apply. It may consist of selecting a sample of subjects to represent a given population, and grouping or pairing subjects to secure homogeneity.

6. **Carrying out the Study.** It is necessary here to insist on close adherence to plans and experimental design. This will involve controlling variable or non-experimental factors, applying the experimental factor or factors, and keeping a careful record of steps in the procedure.

7. **Measuring the outcomes.** Careful consideration must be given to the selection of the criterion on the basis of which the results are to be measured.

8. **Analyzing and Interpreting the Outcomes.** The results pertaining to the factors under study should be clearly noted. The danger of other extraneous uncontrolled factors affecting the experiment should be properly recognised and avoided. The analysis of data demands expert use of statistical procedures. Only then the analysis becomes the basis for valid interpretation.

Of course, statistics cannot correct faults in the design or overcome inadequacies in the basic data. Statistical tools do not relieve the scientist of his responsibility for planning the study, for controlling extraneous factors, and for obtaining valid and precise measurements.

9. **Drawing up the Conclusions.** The conclusions of the study must be restricted to the population actually covered, care must be taken not to overgeneralize the results. The results also pertain only to the conditions under which they were derived. Care must be taken to restrict the conclusions to the conditions actually present in the experiment. The experimenter must not fail to recognize the limitations underlying his conclusions.

10. **Reporting the Results.** The study should be reported in sufficient detail so that the reader can make judgement as to its adequacy.

EXPERIMENTAL DESIGNS

Experimental design is the blueprint of the procedures that enable the researcher to test hypotheses by reaching valid conclusions about relationships between independent and dependent varriables. Experimental designs vary in complexity and adequacy depending on such factors as the nature of the problem under investigation, the nature of data, the facilities for carrying out the study, and especially the research sophistication and competence of the investigator. Although there are a number of combinations of the various experimental procedures, the basic designs are :

1. The single-group design
2. The parallel—group design
3. The rotation—group design
4. The factorial design.

The single-group design. The single-group experiment also known as one-group method is the most elementary and least rigorous design. It consists of comparing the growth of a single group under two different sets of conditions—i.e., of subjecting the group successively to an experimental and to a control factor for equivalent periods of time and then comparing the outcomes. The procedure might be listed as follows :

1.. Test the group ; intoduce Method A ; test the group again ; and note the gains.

2. Allow for a period of transition.

3. Test the group again ; introduce Method B ; test the group once more ; note the gains.

4. Compare the gains in 1 and 3.

In some one-group studies two or more independent variables are successively administered to the same subjects. One may, for example, try to determine the effect of administering two different drugs on the time required to do a task. To accomplish this, one first exposes his subjects to one drug (T_1 ——IV_1—— T_2) and then to a second one (———IV_2——T_3). By comparing the results of the final tests (T_2 and

T_3) one can make some judgement about which drug (IV_1 or IV_2) enabled the subjects to do the task in the least time. However this design cannot be used unless the influence of the independent variable is completely dissipated before the second independent variable is administered, otherwise, T_3 would be measuring not only the influence of IV_2 but also the carry-over effect of IV_1.

The one-group design has certain advantages and limitations. On the favourable side, it permits an experiment to be conducted by a teacher in his own classroom without assistance. Moreover since the same group and the same teacher are involved, it seems to make a fair attempt at equating the factors of the ability & background of the subjects and the general characteristics of the experimental situation. No part of the difference in the results can be attributed to the variability of the subjects or the teachers.

On the limitations side, this method does not necessarily establish experimental control ; it fails to control many non-experimental variables. It is difficult to ascertain whether the difference between the pretest & post-test scores results from the influence of the independent variable or from other variables. The students may not be equally motivated by the two methods, nor is the teacher equally effective and enthusiastic about both. The disparity if any may be attributable to the fact that students were older, less enthusiastic or more fatigued when they took the second test. Perhaps the difference is a product of the extra effort that pupils exerted because they were proud of participating in the experiment. The practice that the subjects received on T_1 may have enabled them to do better on T_2.

The one-group method of experimentation is relatively inadequate, except for purposes of crude experimentation. Unless it is handled with care, the experimenter may easily give undue credit to the independent variable for causing changes and overlook other conditions that actually account for the results obtained. This design may be found satisfactory when the independent variable produces a relatively drastic effect, making the influence of non-experimental factors practically negligible, also where the experiment is of brief duration, thus minimising the action of irrelevant factors.

The parallel-group design. This is also known as equivalent-group method. It is designed to overcome certain difficulties encountered in the one-group design. Here the relative effects of two treatments are compared on the basis of two groups which are equated in all relevant aspects. The second group which is called the control group, serves as a reference from which comparisons are made. This is essentially the implementation of Mill's canon of difference. In an educational experiment, the groups being compared generally are equated on age, I. Q., motivation, sex, general scholarship, general background and any other factor considered relevant to the problem under investigation. After equating the groups, the investigator introduces an independent variable to the experimental group and allows the control group to carry on in the customary manner. The control group receives no treatment and the other group receives the experimental treatment. After a reasonable interval of time the difference between the two groups provides a measure of the effect of the independent variable. The basic design of parallel-group experimentation might be represented as follows :

Experimental	*Control*
1. Pre-test	Pre-test
2. Experimental factor	Control factor
3. Final test	Final test
4. Comparison of gains.	

The following paradigm and explanation may help us gain a better understanding of the design.

Step I. After equating the groups, the investigator gives all subjects an initial test and determines their mean scores. After this conditions are kept the same for the two groups except that the experimental group—but not the control group—is exposed to the independent variable. After a stipulated period, both the groups take a second test and the average score for each group is found.

Experimental Group M_{1E}......IV......M_{2E}
Control Group M_{1C}..............M_{2C}

Step 2. The difference between the mean scores that each group made on the first and second test is found :

Experimental Group $M_{2E}-M_{1E}=D_E$
Control Group $M_{2C}-M_{1C}=D_C$

Step 3. By comparing D_C and D_E—the mean change in scores or the mean gain in scores obtained by the two groups—the investigator can determine whether the application of the independent variable caused a significant change in the experimental group's scores as compared to the control group's scores.

The equivalent group design can be extended to permit the study of two or more independent variables. Three or more equated groups may be selected, for example, and one method can be applied to the first group, another method to the second group, and customary method to the third group. The following paradigm indicates the process

First Experimental Group M_1E_1......IV_1......M_2E_1
Second Experimental Group M_1E_2......IV_2......M_2E_2
Control Group M_{1C}................M_{2C}

Where equivalence of the groups has been established, such a design can generally provide reasonably dependable conclusions. To accomplish the task of equating groups, a researcher may employ the co-twin, matched-pairs, matched-groups, randomized-groups or statistical technique.

Co-twin Technique. Because nature does an excellent job of pairing identical twins, the so called co-twin control is one of the most accurate pairing procedures known.

Matched-pairs Technique. Because a sufficient number of twins is rarely available for most experimental studies, investigators often employ matched-pairs technique. In this method, an analysis is made to determine what factors influence the dependent variable. If reading ability, I.Q., sex, and socio-economic background exert an influence, one tries to find two subjects who are alike in these respects. After selecting a sufficient number of pairs, one assigns a member of each pair—usually at random—to the experimental group and the other member to the control group. Thus, the two groups are as nearly alike as the matching procedure permits.

Finding matched pairs often proves to be an extremely difficult process. One has to measure the relevant factors for a large number of subjects before finding a sufficient number of qualified pairs. Much time and effort is employed in testing subjects who quite often cannot be used in the study. Deciding which of the relevant variables should be given consideration in pairing often presents another problem. If the remaining relevant factors—those not used as a basis for matching—are not randomized in the two groups they may bias the conclusions. The possibility of subjects dropping out of the experiment is ever present and the loss of any cases may impair the matching design.

Matched-group Technique. When it is not possible to find matching subjects, groups may be matched. To do this, one selects control and experimental groups that have the same mean scores of each relevant variable and a similar distribution pattern of subjects' scores around the average.

The matched group technique is also not free from disadvantages. Suppose that one is matching two groups in terms of intelligence and some skill. Even though the distribution of the IQ's and skill scores is equated for the two groups, it is possible for subjects in the groups to have different combinations of these capacities as the following illustration reveals :

Group X : Low IQ's with high skills and high IQ's with low skills.

Group Y : High IQ's with high skills and low IQ's with low skills.

If these differences exist, they can affect the conclusions of the study.

Randomized Group Technique. Determining what factors to equate, precisely measuring the known relevant factors, and finding matched subjects cannot always be done. To achieve equivalence of the experimental and control groups in such instances, one may employ randomization technique. Randomization is not an arbitrary method of selecting subjects, it is a systematic procedure. Some mechanical randomization technique is employed that gives each individual in a population an equal chance of being placed in any given group. Quite commonly the people are numbered consecutively and a published Table of Random Sample Numbers is used to assign each individual until half are placed in one group and the other half in the other group.

Statistical Techniques. Sometimes it is impossible or impractical to control variables by direct selection of subjects. A headmaster of a school, for example, may be unwilling to reorganize classes on a matched basis for experimental purposes, but he may permit an investigator to study two classes as they are constituted. If groups cannot be equalized prior to experimentation, stastistical control procedures are employed. This is necessary in cases where a factor that influences the dependent variable is not observable until after an experiment is under way. In a study of the effect of different diets, for example, all subjects may be given the same amounts of food, but not every subject will necessarily eat everything he is given. But this factor can be observed and measured during the experiment and accounted for by statistical procedures when analyzing the results.

The most commonly used statistical control is known as the analysis of covariance. The investigator observes the uncontrolled variable in the two groups during the experiment and makes appropriate adjustments for the source of variation in the analysis of the outcomes. This statistical procedure, permits an investigator to carry out an experiment with the same precision as if he had matched the experimental and control groups.

The Rotation-Group Design. When the experimental and control group are only approximately equivalent in relevant factors, it may be possible to conduct the investigation by rotating the groups at periodic intervals. This method overcomes the difficulties encountered in the equivalent-group method. It is commonly employed in situations where a limited number of subjects are available. In the first stage, Group A experiences the experimental variable (IV_1), while Group B is exposed to the traditional or other treatment (IV_2). In the second stage, the groups rotate their roles.

Stage 1	*Stage 2*
Group A : IV_1	Group A : IV_2
Group B : IV_2	Group B : IV_1

Thus the researcher applies the same independent variables to different groups at different times during the experiment. The following discussion gives a detailed explanation of what is done :

Stage 1. The two groups take pretests to ascertain what they knew about the Life Insurance and the mean score for each group (M_1) is found. Then Group A receives text book instruction (IV_1) on this unit. while Group B takes field trips (IV_2) to the Life Insurance Corporation. Afterwards, both groups take a second test and the average score for each group (M_2) is found.

Group A : M_1………………… IV_1………… M_2
Life Insurance ….. *Text*……… *Life Insurance*
Group B : M_1… …………… IV_2……… M_2
Life Insurance…… *L.I.C.*……. *Life Insurance*

Then the difference between the mean scores that each group made on their first and second tests is found.

Group A : $M_2-M_1=D_1$ *Text*.

Group B : $M_2-M_1=D_2$ *Field*.

Stage 2. In the second stage of the experiment, both groups take pretests on what they know about Banking, and the average score for each group is found. But this time Group A rather than Group B goes on the field trip (IV_2) and group B receives the Textbook instruction (IV_1). Afterwards both groups take a second test and the mean score is found for each group.

Group A : M_1…… IV_2…… M_2
Banking…… *Field*…… *Banking*
Group B : M_1…… IV_1…… M_2
Banking…… *Text*…… *Banking*

Then the difference between the mean scores that each group made on their first and second tests is calculated.

Group A : $M_2-M_1=D_3$ *Field*.

Group B : $M_2-M_1=D_4$ *Text*.

Stage 3. The mean change in scores obtained by the two groups from the Field trip instruction is added —D_2+D_3— and also the mean change obtained from Text book instruction —D_1+D_4— and the results are subjected to a statistical analysis that permits one to appraise the effectiveness of the methods.

The rotation method rotates out some nonexperimental factors. For example, if children in one group are more able than those in the other group, both independent variables—the field and the textbook methods—will profit equally from their superiority. If the subject matter and test used in the Banking unit are more difficult than those used in the Life Insurance unit, the difficulty is rotated out because both the field and textbook methods come under these influences. When students are exposed to the second unit of work, they may be more mature and they may carry over some of the learning acquired on the first unit, which will influence their test results. But since both independent variables are exposed to these influences once during the experiment, the effect on maturation and carry-over learning on the dependent variable tends to be minimized.

However, the rotation technique cannot equalize effectively all non-experimental factors. If the carry-over learning from IV_1 to IV_2 and from IV_2 to IV_1 for example, is not of the same magnitude in both instances, the carry-over factor may be minimized but it will not be equalized. Nor can the rotation technique cope adequately with factors such as bias on the part of the teacher or the tests in favour of one experimental variable. Neither is equalization achieved if subjects in one group become more fatigued or less highly motivated with the progress of the experiment than the other group.

A more adequate design, which would incorporate the advantages of both the equivalent group and the rotation-group design, is the rotation of equivalent groups. A further extension might have equivalent groups rotated back and forth from one method to the other a number of times.

Unfortunately, all these designs are based on the law of the single variable, and as such are of limited value in promoting education as a science except in problems of relatively limited complexity. This is not to minimize their worth. Undoubtedly, a number of problems can be investigated through such procedures.

The Factorial Design. At a more adequate level, particularly from the stand point of the complex problems with which social sciences are concerned, are the factorial designs — or multivariate analysis — which permit the simultaneous evaluation of the effects of a number of factors taken singly and in interaction with one another. These modern experimental designs have made educational problems more and more amendable to investigation in their sub-aspects, as well as in their entirety. It is impossible for instance, to investigate teacher effectiveness through a factorial design incorporating such factors as experience, qualifications, scholarship, personality, and so on.

Among the more common approaches to multi-variate analysis are Latin squares, Greek squares, randomized blocks and confounding designs. A particularly thorough treatment of a 2×3×3×3 arrangement dealing with achievment in high school Biology is given by Johnson and Tsao. The example incorporates analysis of covariance introduced as a means of controlling the factors of mental age and pre-test scores and thus increasing the sensitivity and precision of the test of the various hypotheses.

A design commonly used in biostatistical experiments is the *Latin square*, which might be conceived as a form of rotation design in which a variety of treatments are assigned to different groups under different experimental conditions In a 4×4 Latin square, for example, four different teaching methods may be randomized among four different motivational approaches so that every combination of method and motivation is represented by at least one group. Any number of these patterns can be devised to incorporate any number of variables.

A particularly interesting experimental design is Johnson-Neyman technique which permits not only the determination of the relative effectiveness of variables, but also the region for which a given variable is effective. For example, rather than compare the relative effects of gifted teachers and less gifted teachers on student growth, it might be possible to derive the conclusion that gifted teachers are significantly more effective in promoting the academic growth of gifted children, and that less gifted teachers are significantly more effective in promoting the growth of duller children than any other combination of teacher and pupil ability.

Multivariate analysis constitutes in most cases, a more effective approach than the traditional method. On the other hand, it tends to be unwieldy. For example, an adequate comparison of five factors at each of two levels would require a minimum of thirty two observations—that is, five primary effects, ten first-order interactions, ten second-order interactions, and five third-order interactions, and one fourth-order interaction involving all five factors. Because of their complexity such experimental designs require knowledge of statistics beyond the average teacher's competence.

Lindquist gives another classification of experimental designs consisting of six typical designs :

1. **Simple Randomized Design.** It is applicable in situations where instead of one difference between two means, many differences between many means are compared. The labour of two-by-two comparisons is curtailed and a summary of judgement obtained by the analysis of variance. The large group is randomly divided into required number of sub-groups and each sub-group is exposed to an independent variable. In this way the influence of any number of experimental variables can be judged at the same time.

2. **Treatments and Levels Design.** For a further refinement, members drawn randomly from several levels of a relevant variable are included in each group. This is like introducing a factor of lateral classification on a continuous or graded variable. This kind of stratification by a related variable within each factor column tends to equate the groups somewhat in a significant attribute. This rules out the disturbing effect of the attribute and increases precision. Matched groups is an extreme form of this equating process because the two groups are formed there from members of equated pairs.

3. **Treatments and Subjets Design.** This method carries the equating to the point of identity, so that the same persons are subjected to several treatments turn by turn. In this case inter-subject differences are completely ruled out. The requirement that the same persons should be repeatedly subjected to several treatments restricts the scope of the method. Precision is better than ever before, provided the experimental procedure is safeguarded against the effect of repetition of treatments.

4. **Random Replication Design.** It provides for several replications of the same simple randomized design so that differences between replications can also be considered. The errors due to sampling of groups and repeat experimentation can be cancelled out in this type of more expensive analysis.

5. **The Factorial Design.** It has been discussed earlier also. It involves two-way and higher-order analysis leading to double, triple and higher order interaction variances. This is possibly the most useful and elegant design, if its conditions are met in the data.

6. **The Groups-within-Treatment Design.** If the population is available in many intact groups, cluster-sampling of such complete groups under each treatment gives this kind of set-up. In Lindquist's example, classes drawn from various schools are taught by different methods. If there are two methods, I and II and schools are from A to H and the class VIII, then under this design the following type of allocation will be possible :

I	Class VIII	A D E H
II	Class VIII	B C F G

LIMITATIONS OF EXPERIMENTAL METHOD

Although it is the most scientific among the methods of research available, experimental method also suffers from a score of limitations.

Extraneous Variables. In educational experiments, a number of extraneous variables are present in the situation or are generated by the experimental design and procedures. These variables influence the results of the experiment in ways that are difficult to evaluate. In a sense, they introduce rival hypotheses that could account for experimental change not attributable to the experimental variables under consideration.

Concept of Causation. Causation implies an invariant one-to-one relationship between certain antecedents and certain consequents. In keeping with the emphasis on the law of the single variable, the investigator attempts to control all relevant factors except the experimental factor and thus he promotes certain outcomes which are then measured and attributed to the operation of the variable under investigation. Unfortunately, such ideal conditions are rarely fulfilled. It is almost impossible to equate two situations in all respects except for the factor whose effect is being investigated. Moreover science is not interested in the effect of a single factor examined in isolation, but rather in the joint effect and interaction of many factors operating simultaneously.

Experimental control. The experimental control is theoretically unsound, since imposing control on a situation tends to make the situation artificial. Even if complete control could be obtained, it would only serve to violate the basic principle of maintaining the situation in its natural form.

Maturation. Subjects change in many ways over a period of time, and these changes may be confused with the effect of the independent variable under consideration. Between initial and subsequent observations, subjects may become tired, bored, wiser or influenced by the incidental learnings and experiences that they encounter through normal maturation.

History. Specific external events beyond the control of the researcher may have a stimulating or disturbing effect upon the performance of subjects. The effect of an accident, the emotional tirade of a teacher, a pep session, the anxiety produced by the approaching examination, or a cala mity in the community may significantly affect the test performance of the students. May be, these external events have a similar effect on both experimental and control groups, but since they are specific events, they may affect one group but not the other.

Testing. The process of pretesting at the beginning of an experiment may produce a change in subjects. Tests may sensitize individuals by making them more aware of concealed purposes of the researcher and may serve as a stimulus to change. Pretesting may produce a practice effect that may make subjects more proficient in subsequent test performance.

Interference of prior treatment. In some experiments the effect of one treatment may carry over to subsequent treatments. Learning produced by the first treatment is not completely erased and its influence may accrue to the advantage of the second treatment. This is one of the major limitations of the single-group design.

Unsuitable Instrumentation. Unreliable instruments or techniques used to describe and measure aspects of behaviour are threats to the validity of an experiment. If tests used are not accurate or consistent, a serious element of error is introduced. Changes in the standards of observers due to fatigue, increased insight or skill, or changes in criteria of judgement over a period of time are also likely to introduce error.

Statistical regression. Statistical regression is a phenomenon that sometimes operates in pre-test, post-test situations. Subjects who score highest on a pretest are likely to score relatively lower on a retest, whereas, subjects who score lowest on the pretest are likely to score higher on a retest. In pretest—retest situations there is a normal regression towards the mean. Failure to recoginze this regression effect may lead researcher erroneously to attribute unwarranted gain to the lowest group and loss or small gain to the highest group.

Differential selection. Selection bias is represented by the non-equivalence of experimental and control groups. It is likely when, upon invitation, volunteers are used as members of an experimental group. Although they may appear to be equated to the non-volunteers, their characteristics of higher motivation may introduce a bias that would invalidate reasonable comparison. This bias may be introduced when intact classes are used as experimental × control groups. These intact groups are not constituted by randomly selected individuals. Again one cannot assume that samples taken from cooperating schools are necessarily representative. Such schools are usually charactrized by high morale of the faculty, less insecurity, greater willingness to try a new approach, and a greater desire to improve their performance.

Experimental mortality. Mortality, or loss of subjects, likely in a long-term experiment, introduces a confounding element Even though experimental and control groups are randomly selected, the survivors might represent a sample that is quite different from the unbiased sample that began the experiment. Those who survive are likely to be healthier, more able or more highly motivated than those who are absent frequently or who drop out of school.

Placebo—Hawthorne effect. Knowledge of participation in an experiment may introduce the extraneous variable of bias in favour of the experimental group. In medical profession, the effectiveness of the true medication is the difference between the effect of the medication and that of the placebo. A similar psychological effect was recognized in a series of experiments at the Hawthorne Plant of the Western Electric Company in Chicago. This reactive effect of knowledge of participation in an experiment is similar to the placebo effect.

Contamination. Contamination is a type of bias introduced when a researcher has some previous knowledge about the subjects involved in an experiment. This knowledge of subject status may cause the researcher to convey some clue that affects the subject's reaction or may effect the objectivity of his judgement. In medical research, it is common practice to conceal from the subject the knowledge of who is receiving the placebo and who the experimental medication. This is known as a *blind*. Having someone other than the experimenter administer the treatments and record which subjects are receiving the medication and which the placebo provides an additional safeguard. This practice, known as a *double blind*, helps to minimize contamination.

SEVENTEEN

Causal Comparative Studies, Correlation Method

Descriptive research seeks to find factors associated with certain occurrences, outcomes, conditions or types of behaviour. Since it is often impracticable to arrange occurrences, an analysis of past events may be the only feasible way to study causation. For example, one would not arrange automobile accidents in order to study their causes.

Causal comparative method seeks to establish causal relationships by comparing the circumstances associated with observed effects and by noting the factors present in those instances in which a given effect occurs or does not occur. The studies of juvenile delinquency may compare the social and educational backgrounds of delinquents and non-delinquents. What factors, if any, were common to the delinquent group ? What factors, if any, were common to the non-delinquent group ? Any factors common to one group, but not to the other might serve as a possible explanation of the underlying causes of delinquency. The causal-comparative method seeks to establish causal relationships between events and circumstances. It finds out the causes of certain occurrences or non-occurrences. It always starts with observed facts and actual happenings and seeks to discover the antecedents of these facts.

This method is thus, based on Mills canon of agreement and disagreement which states that cause of a given observed effect may be ascertained by noting elements which are invariably present when the result is present and which are invariably absent when the result is absent.

It makes an attempt to seek answers to the problem on hand through the analysis of causal relationship. Causation is evidently to be studied from the actual occurrences as they happen for they cannot be arranged by the researchers at will nor can they be pre-planned.

It is customary to distinguish it from other methods. In the case of historical method, we know that it is sometimes directed towards the establishment of causal relationships, but it deals with the past whereas causal comparative method deals with the current situations. Historical research finds out the causes of the past events only. And here lies the difference between the two. It differs from normative-survey research in that the latter is concerned chiefly with status and trends in respect of the present phenomena, whereas causal comparative deals with the antecedents and causes of educational effects. It differs from experimental procedure in that the latter carefully controls its variable factors, whereas the causal-comparative method makes observations under normal or field conditions and does not control the variable factors. It may be taken as a sort of uncontrolled experimentation.

Uses of Causal-Comparative Method

1. The problems of education, as we have seen, are frequently complex. Whether we consider teacher-effectiveness, under achievement, or delinquency, we find that they incorporate a multiplicity of causal factors, contributing factors, and precipitating factors, as well as an unlimited number of other elements of varying degrees of relevance—all operating in different degrees of interaction. Obviously, any attempt to investigate the effect of any one of these aspects through a series of small experiments, through the use of multivariate analysis or through factorial designs is not likely to yield anything but a series of half-answers. A common approach towards insight into such complex situations is to select two groups at opposite sides of the continuum in order to identify the factors on the basis of which one group can be distinguished from the other.

2. It is admirably adapted to many types of field studies concerning the problems of character development, the effectiveness of health education and the like which do not lend themselves to rigorous experimentation.

3. Another type of situation to which experimental procedures are not readily applicable is the study of the interrelationships of factors as they exist under natural conditions.

4. Still another situation for which experimentation is not adopted arises when one is more interested in discovering the antecedents of a particular case than in discovering or verifying a large generalization concerning such antecedents. This may be the situation, for example, in studying the factors contributing to a high cost of education in some locality or in ascertaining why unit costs of two school systems differ.

5. The field of comparative education may be approached from the point of view of causal-comparative analysis. Instead of merely studying the ways in which the school systems of various nations differ, one may go further and set these differences in relation to their antecedents which lie in the social and political philosophy of the people.

Procedure of causal-comparative Method

In carrying this type of research in full, there are three important steps in the logic to be met :

(*i*) Gathering data on factors (circumstances) invariably present in cases where the given result occurs and discarding of those elements which are not universally present.

(*ii*) Gathering of data on factors invariably present in case where the given result or effect does not occur ; and

(*iii*) Comparing the two sets of data, or in effect, subtracting the second set from the first set to get at the causes responsible for the occurrence or otherwise of the effect.

Instead of arranging a controlled laboratory experiment and inducing subjects to do or become something, a researcher studies a life situation in which subjects are behaving in a natural way. To study, school riots, for example, rather than setting up an experiment to test whether various factors will cause a riot, he compares a community that has experienced a riot with one that has not. After studying the likenesses and differences between the two situations, he describes the factors that appear to account for the riot in the one instance and not in the other.

Likewise, in studies of emotional instability, selected children are not placed in a situation where all factors are kept constant except one variable which is manipulated to determine what causes a particular type of emotional disturbance. Rather, children are chosen, who according to a selected criterion are disturbed and they are compared with a group of children who are 'not disturbed'. A search is made for factors or conditions which seem to be associated with one group and not the other that might serve as a possible explanation of the underlying causes of emotional problem.

The method may achieve its purpose by having either two groups, or a single group for its subjects. Some studies made with two groups of subjects are :

(*i*) Study of differences in the teaching of effective and ineffective teachers.

(*ii*) Study of typical differences between bright and dull pupils.

(*iii*) Qualities of merit possessed by superior and inferior teachers.

Examples of studies made with a single group of subjects are :

(*i*) Causes of poor attendance.

(*ii*) Significance of certain mental and physical character traits for success in a High School.

If through causal comparative research, the causes of events are determined, certain steps may be taken either to promote or prevent such occurrence depending upon the desirability or undesirability of the same. Causes and effects are dichotomous variables which vary in varying degrees. Therefore a large number of cases or occurrences should be observed and interpretations should be made cautiously.

Limitations of Causal-Comparative Method

1. The first limitation of this research method is that it is essentially dichotomous. Both results and causes are thought of as either occurring or not occurring ; whereas in reality they both may occur in a great many degrees. That is, we do not have merely good teaching and poor teaching, but we have in the main average teaching (the average being usually the most prevalent condition), with the quality of teaching shading upward and downward from the average by very fine degrees. The causal comparative method considers only those instances that are recognized as good or bad, poor or excellent, etc. All other degrees of excellence or performance are disregarded. Many important causes and results occurring in moderate degrees are thus ignored.

2. Likewise a dichotomy is assumed for each of the factors or circumstances noted. The element is either present or absent. In actuality, factors are always present in some degree, and this degree may usually vary from zero to a very strong significance by fine degrees. The factors are not always either absolutely present or absent.

3. Another limitation grows immediately out of the first one. It is that the methood, particularly when applied strictly, will not reveal all of the causes. If one notes only causes which are invariably present when the result occurs and invariably absent when the result does not occur, he is overlooking all of the causes which contribute in a moderate degree to the occurrence of the result. When the element of frequency of occurrence and the concept of partial or contributing causes are introduced, the method becomes more sensitive and will reveal many more of the factors which enter in as causes.

4. It does not give any evidence of the interrelation and interdependence of these causal factors. That is, to what extent is a given factor contributing in its own right to a result, and to what extent does this factor contribute simply because some other factor is acting upon it and making it behave in a certain way.

5. It is not well-adapted to the study of individual cases. Rather, it necessitates observation of a large number of cases arising from a large variety of circumstances. If the variety is not sufficiently great, one may draw erroneous conclusions. Regarding individual, we cannot discover the reasons why he cannot read well, why he cannot pass, or why he cannot win friends.

6. If the relevant factor causing a particular condition is not

included among the items being considered when studying the problem, the real cause cannot be ascertained. The researcher must have considerable general knowledge of his phenomena and must plan his study with care if he is going to spot possible relevant causes and eliminate chance associative factors from his study.

7. The method requires that there is a single critical factor responsible for the occurrence or non occurrence of the phenomenon. But this condition is rarely found when working with complex social phenomena, for events usually have multiple rather than single causes. For example, there cannot be one and only one decisive factor responsible for good teaching.

8. A phenomenon may result not only from multiple causes but also from one cause in one instance and from another cause in another.

9. Detecting relationships does not necessarily solve problems about the cause of a condition. The fact that two subjects have something in common may be a chance circumstance and not related to the cause of the phenomenon being studied. When a cause-effect relationship is discovered, it is not always easy to determine which is the cause and which is the effect. Also two factors may appear together, the one may not necessarily be the cause of the other, for both of them may be caused by a third factor or a complex of factors.

10. In comparative studies of natural situations, the researcher does not have the same careful control over the selection of subjects as he does in well designed experimental studies. It is extremely difficult to find naturally existing groups of subjects who are similar in all respects except for the exposure to one variable.

11. For a successful study of this type one needs careful observation, insight, thought and work. Only a trained and competent researcher can employ this method with reasonable success. Accurate and meticulous observation is particularly important in research which is seeking causes, since factors present in small amounts may be of large siginficance.

Each research method is valuable for certain purposes and relatively worthless for others ; an important part of understanding the value of any method lies in knowing its limitations so that it will not be used where ineffective or misleading. Causal comparative studies often do not produce the precise. reliable knowledge that can be gained through good experimental studies. But they do provide a means of tackling problems that cannot be probed in laboratory situations and they do yield valuable clues concerning the nature of phenomenon. As the techniques, tools and controls used in conducting causal comparative studies have been improved this method of inquiry has gained greater respect.

THE CORRELATION METHOD

The correlation method is of recent origin, but is already ranked high among the important research methods in education. This is another type of genetic investigation which uses highly mathematical techniques. This device, when employed for prognosis, traces the relationship of measured variables over definite periods of time. But the method does not denote merely a statistical device of calculating coefficients of correlation between certain variables. On the other hand, it is a research approach which analyses the relationship between data, between variables and some other results in such a way that the underlying pattern of relationships becomes clear. No doubt, it utilizes the correlation technique of analysis, but it goes far beyond and includes many other important elements.

Its place in sociological research is almost the same as that of the laboratory method in physical science research. It is a definite improvement over the causal-comparative method. It approaches the problem of cause and effect in terms of degrees, not only dichotomies. It deals with problems in terms of many variables and reflects the variation of many factors at once rather than in terms of a single variable at a time. Variables may be closely related, moderately related or completely unrelated. In general, the magnitude of a correlation depends upon the extent to which an increase or decrease in one variable is accompanied by an increase on decrease in the other—whether in the same direction or the opposite direction. Correlations range over a scale from a perfect negative correlation to no correlation, and to a perfect positive correlation.

This method is also considered an improvement over experimental method. As earlier stated, it enables one to deal with the problems in terms of many variables rather than a single variable at a time. Again it is not necessary in this method to depend upon strict experiments and rigid controls. This method shows the way that with certain types of problems it is not necessary to depend upon strict experiments for determining causal relationships. It has proved to be an equally dependable alternative. It reflects the simultaneous variation of many factors rather than studying the variation of a single factor when all the others are held constant. By this method the reality can be more directly approximated in one's data.

Uses of Correlation Method

1. The concept of correlation is fundamental to prediction based on association among variables. It must be realized that correlation is not synonymous with causation ; correlation simply implies concomitance. It is used to predict scholastic success by utilizing available data, or special data from the use of aptitude or prognostic tests. The prediction, of course, is not individual, but an average prediction. Correlation is a group concept, a generalized measure which is useful primarily in predicting group performance.

2. It is used to measure the strength of association or the degree to which variation in one factor, or set of factors, is associated with variation in others.

3. Social scientists find it particularly useful in studies of prediction and cause and effect. Researchers are often asked to find a means of predicting whether pupils or employees will be successful on the job or in mastering particular skills or subject matter. For example, it may be used to predict teaching success and select teachers according to a composite criterion of teaching success secured through the technique of multiple correlation which takes account of many variables at once.

4. It may also be used to analyze cause and effect. Suppose that from observing typing classes you have decided that the amount of time spent in glancing away from the copy is inversely related to typing speed. To test this hypothesis, you may have the students type the same copy. After recording the typing speed of each student and the amount of time spent in glancing away from the copy, you compare the speed scores with the glancing away time and discover that a negative correlation exists *i.e.*, the lower the typing speed a student achieves, the more time he spends glancing away from his copy.

5. It can also help in predicting school population which is a necessary aspect of educational planning.

6. It helps in fundamental research through (*a*) the construction of data-gathering tools e.g. tests, and the determination of their reliability and validity ; (*b*) factorial analysis *i.e.* an analysis of some psychological phenomenon like intelligence.

The steps of Correlation Method

The correlation method involves all the steps that are gone through in other kinds of research. It requires for its material quantitative data in the form of scores in respect of different variables under consideration. These scores are analysed by finding out measures of relationship between different sets of data. The steps may be stated below for greater clarity :

1. Sensing the problem and defining it.
2. Determination of objectives.
3. Determination of tools for investigation.
4. Formulation of hypothesis.
5. Collection of data through relevant measurements, tests, etc.
6. Analysis and statistical treatment in the form of coefficients of correlation.
7. Interpretation of the coefficients of correlation.
8. Inferences and conclusions.

Cautions in the use of Correlation Method

The interpretation of the calculated coefficients of correlation presents some difficulties. A researcher has to keep in mind many things while working out these interpretations. Chief among those are the following :

1. Coefficients of correlation do not represent percent of anything. They are pure mathematical symbols and should never be mistaken for anything else.

2. They are not to be interpreted in a linear sense, *i.e.* a coefficient of ·80 is not to be regarded as twice as high as a coefficient of ·40.

3. Ordinary correlation procedure assumes that the data will be linear when plotted ; that is, will cluster along a trend line that is straight rather than curved. But there are other methods for calculating correlation for curved relationships. If the relationship is curvilinear, the ordinary coefficient of correlation (known as Pearson product-moment coefficient) will give a lower indication of functionality than can be obtained by other measures.

4. Errors of measurement are important factors and should always be accounted for. These errors, if variable and if not correlated with the magnitude of the measurements, will lower the calculated value of r.

5. Size of r depends largely on the range of measurements used in the calculation. That is, a higher correlation will be found between the mental age of pupils and their chronological age if we collected the data over say eight grades than if we use the data from a single grade.

6. Allowance must be made for a sampling variation in the magnitude of r with the help of the measure of Probable Error.

7. If any two traits that are being correlated happen to be ratios with a common denominator, such as age of pupils, the resulting correlation cofficient will probably be spuriously high for ordinary purposes. It must not be used as an indication of the relationship between the numerators.

8. A big r between factors may, in social sciences denote only occurrence – not causation necessarily. Partial Correlation and Analysis of Variance might be useful devices in such cases.

9. Series of data in social sciences are not good measures of what they are presumed to measure, so that the relationship found, though true within the limits of sampling fluctuation for the data used, may not represent well the relationship between the factors which one desires to study.

EIGHTEEN

The Case Study and Genetic Method

THE CASE STUDY

The case study is potentially the most valuable method known for obtaining a true and comprehensive picture of individuality. It makes an intensive investigation on the complex factors that contribute to the individuality of a social unit—a person, family, group, social institution or community. The purpose is to understand the life cycle or an important part of the life cycle of the unit. It is an analysis of complex causation. It is a form of qualitative analysis involving the very careful and complete observation of a person, a situation or an institution. It probes deeply and analyzes interaction between the factors that explain present status or that influence change or growth. It is a longitudinal approach, showing development over a period of time. After probing deeply into the factors and forces that condition its behaviour and analysing the sequences and interrelationships of those factors, one can construct a comprehensive. integrated picture of the unit as it functions in society. It makes possible a synthesis of many different types of data and may include the effects of many elusive personal factors in drawing inferences. Initial concepts in new fields of science frequently result from the analysis of individual cases.

It is closely related to experimentation whose purpose also is to identify the antecedents responsible for the occurrence of such phenomena as reading disability, maladjustment, immaturity and delinquency. Actually case study resembles almost all other types of research. It borders on historical research, for instance, in the sense that the present case can be understood only in view of its past. It is closely related to documentary research in that it deals with living individuals in their present social environment. Case studies resemble survey studies in that they are concerned with the present status of the phenomena. They differ from survey studies, however, in that the determination of status is only a secondary aspect in the situation, the more fundamental question is experimentation in that they display a greater element of subjectivity and intuition and are generally oriented towards the solution of a particular problem at the individual level rather than towards the derivation of generalizations that have scientific validity. Although case studies constitute the most comprehensive means of studying the whole child, a distinction needs to be made between their guidance and their research functions. Undoubtedly, case studies used for guidance purposes can lead to the derivation of relationships tnat have a bearing on research and vice versa. Yet, in the strict sense of the term, research is concerned with the derivation of generalizations that apply beyond the individual case and case studies become research only when they are able to supply such generalizations.

Uses of Case Study

1. The case study method has come to be recognized as a useful mode of investigation into the causal relationships of complex educational phenomena.

2. It has been frequently employed in education in studying problem cases, maladjusted pupils and scholarship difficulties. It is obviously an important source of educational ideas.

3. It is also employed in studying the general characteristics of phenomena of any given class, as for example, case studies of truants in a backward area, the learning difficulsies of pupils in methamatics, the teaching difficulties of beginning teachers.

4. Initially case study method was limited primarily to problems of maladjustment, however, more recently this aoproach has been extended to the investigation of normal or gifted children, successful institutions, ideal teachers, ideal children, well organised communities and more effectively functioning cultural groups.

5. The findings of case studies form the basis of guidance in preventing maladjustment.

Characteristics of a Good Case Study

1. It should be based on adeqnate and complete data.
2. Its data should be valid.
3. It should have continuity about it.
4. Its records should be kept confidential.
5. Its data should be scientifically synthesized and this synthesis should be as much prognostic as diagnostic.
6. Its follow up work should be undertaken.

Nature of Case Study Data

The data may be collected under the following heads :

Psychophysical Examination. Vision, hearing, speech, neuromuscular coordination.

Medical Examination. Height-weight ratio, nutrition, teeth, general health, bodily ailment, disease or disturbance of the nervous & glandular systems, worms, adenoids.

Mental Condition. General intelligence through verbal, non-verbal tests, special abilities.

Temperamental Aspect. General emotionality, complexes, neuroses, interests, attitudes or sentiments, character.

Health History. Conditions of pregnancy & birth, dates of talking, walking, dentition, school, puberty, accidents, illnesses, operations, family life.

Educational Testing. Reading, number, handwriting, composition, appreceptive mass, capacity for sustained application, attitude, special skill or knowledge, general information & culture.

School History. Promotions, kind of work done, mobility, quality of school attended, relations with teachers.

Family History. Ancestry, parents, siblings, home conditions, economic status & history, cultural resources, relations within home, control, attitude of parents towards society.

Social History. Contacts, attitude towards own religion, mixing with children of the same age, undesirable company, sex history, delinquency.

Methods of Data gathering in Case Study. Case study data may come from numerous sources. The major problem of the case study is essentially the same as that of the historical method—that is obtaining dependable data from which valid interpretations are to be derived. Not only are gaps bound to exist in the data, but the data that are available generally have not been collected for the purpose of elucidating the present problem, and invariably they are incomplete, and otherwise inadequate.

The investigator may procure personal testimony from subjects by asking them to recall various past experiences or to express present wishes in interviews or questionnaires. He can also employ observation by himself or his informants regarding physical characteristics, social qualities or behaviour of the case being studied. Personal documents, such as diaries and letters and various physical, psychological or sociological tests or measurements may yield valuable information. Data may also come from parents, brothers and sisters, relatives, friends, co-workers, school, hospital, church, newspapers, business agencies, government agencies, courts or other sources. The subject may be asked o answer opinionnaries to reveal his opinions, feelings and attitudes.

The Steps of the Case Study

If it is to be accepted as a scientific technique, the case study must follow essentially the same steps and meet essentially the same criteria as do the other research methods. Its steps can be enlisted as under :

1. **Selection of the cases.** The selection of the cases which exemplify the problem area under investigation is obviously the first step. There is

especially a need for typical cases. Since case studies cover many facts of the total picture and extend over a long period of time and are therefore time consuming and costly, it is common practice to restrict the study to the thorough investigation of a few cases.

2. **Determining status of the phenomenon.** Either by direct observation or measurement, the status of the phenomenon under investigation must be determined. He establishes the fact that the phenomenon under investigation is inadequate in some vital respect or stands in need of scientific study.

3. **Formation of a hypothesis.** Then he will formulate a tentative hypothesis which will guide him for data collection on the individual cases. His judgements about the probable hypothesis are the products of past experiences and researches with similar cases, symptoms and antecedents arrived at by means of incidental or systematic observation, or both.

4. **Collection of data.** The investigator collects what appears to be relevant data, observes behaviour, administers tests, examines products. Some of the data will be readily available from records and will pose no problem of collection. There will be the need for its verification and interpretation. Generally when these data were recorded, present needs were not anticipated. The data were probably not collected and recorded systematically enough to be dependable and understandable in the context of the present problem. The cumulative record, for example, may include test scores recorded without date or identification.

Data collection involves the use of observation, interviews, tests and other data-gathering devices and techniques designed to provide information on the individual's life history, his health history,his scholastic history, his home and community background, and any other aspect of the situation that might clarify the present problem. This information will have to be checked for accuracy; much of it will be relatively unverifiable except on the basis of general plausibility.

5. **Tentative diagnosis.** The next step is the derivation of tentative diagnosis of the likely antecedants of the difficulty. The investigator evaluates the data collected, compares data with past experiences and norms, and reaches a decision that not all is well. He seeks the conditions leading to or accompanying the inadequacy. From these circumstances and conditions, he selects a supposed cause or causes. He reviews his own past experience, consults with others, and re-examines the scientific literature relative to similar situations, and looks for symptoms that might indicate the presence of some disabling deficiency. He further checks for the presence or absence of the supposed cause, through systematic investigation when such appears necessary.

6, **Instituting remedy.** He re-examines his own past experience and scientific investigations for ideas relating to a course of action. Then chooses from several alternate courses of action those that appear to be appropriate to the immediate situation. He institutes a treatment programme accordingly. The diagnosis cannot be considered complete until the conditioning circumstances supposed to explain the case have been removed and the effect observed. If several adjustments have been suggested by the diagnosis, and if one desires to know the potency of each particular factor, then one must modify a single circumstance at a time, with all others held constant, as suggested by the law of the single variable.

7. **Follow-up or rechecking.** The final step is the follow-up of the case from the standpoint of its response to treatment. This constitutes a test of the validity of the diagnosis. A recheck is employed to determine adequacy of behaviour, performance or output. It involves remeasurement of the phenomenon under investigation to ascertain what changes, if any, have been produced in its status by the modifications made. If the change is a positive one, and in an amount thought significant, then the diagnosis can be judged correct.

Limitation of Case Study

1. A generalization drawn from a single case or a few casually selected ones canot be applied to all cases in a population.

2. The difficulty also lies in selecting subjects or units for a study that are representative or typical.

3. While collecting evidence from records, documents, etc. we have to accept data that are the product of errors of perception, faulty memory, deliberate deception, unconscious bias, the subject's desire to present the right answer, and the tendency to overemphasize unusual events or to distort them for dramatic effect.

4. The method may look deceptively simple. To use it effectively, the researcher must be thoroughly familiar with existing theoretical knowledge of the field of inquiry, and skillful in isolating the significant variables from many that are irrelevant. There is a tendency to select variables becanse of their spectacular nature, rather than for their crucial significance.

5. Subjective bias is a constant threat to objective data-gathering and analysis. His preconceived convictions may lead the researcher to an unwarranted feeling of certainity about the validity of his conclusions.

6. Effects may be wrongly attributed to factors that are merely associated rather than cause-and-effect related. The case study process is susceptibte to this *post hoc* fallacy.

THE GENETIC METHOD

Genetic study is a long term investigation of origin, direction, trend, rate, pattern, limit and decline of growth. It covers a longtime investigntion of biological phenomena. It determines whether the child is moving forward, is stationery or even slipping backward. These studies are concerned not only with the existing status and interrelatinships of phenomena, but also with changes that take place as a function of time. It determines whether the particular level reached represents optional growth in relation to ability, a matter of special importance in the instruction of gifted children.

Genetic research resembles a number of other research techniques. It is very much like case study in many ways. The comparison of the two being presented later on will be of interest. Like historical research, it is concerned with the occurrence of past events. It also approaches the experimental method, particularly when the development of indentical twins is compared under slightly different environmental conditions. It is closely related to survey methods in that it is concerned with the status of a phenomenon at successive stages of growth. It differs from all of these in purpose, however. It is not interested in the present status of development, nor in its historical background, nor even in the ways in which phenomena can be modified through the manipulation of environmental conditions—but simply in the pattern of development.

The techniques of genetic research have to be adapted to the age and nature of the subjects. For instance, in studying infants, it may be necessary to use direct measurements, observations through one-way screens and so on. For older children, on the other hand, tests of the pencil-and-paper variety might be used. It can also vary in duration. For example, genetic studies of a short duration could be conducted with respect to such factors as academic growth, which is relatively rapid. On the other hand, short-term genetic studies would not be effective for studying some of the more slowly developing aspects of growth, such as personality.

The scope of developmental studies has been extended beyond the earlier physical and anatomical studies to phases of mental, social and personality development. It is also realized that the genetic method, in the broader sense, must include as its purpose developmental diagnosis, i.e. the study of cause and effect relationship, too

Purposes. Main purposes served by this method are :

1. Genetic studies of Genius are landmarks in the investigation of giftedness. The longitudinal series of studies, spanning over more than a half century, enabled the researchers to examine the characteristics of gifted individuals and to follow them from childhood through adulthood, evaluating some of the influences of giftedness upon their development as individuals and as creative contriburors to society.

2. Because of the importance of child growth and development to the whole process of education, *genetic or developmental research* is of primary interest to teachers, particulary to those of the elementary school.

3. In general, this method provides a faithful record of past events in the developmental history of individuals or groups under study.

4. It helps to discover principles of development and common features in the history of individuals or groups.

5. It determines changes in interests, abilities and capacities from one age level to another among Individuals as well as groups.

6. It delermines age-grade norms of development for groups of children.

7. It endeavours to find cause and effect relationship among phenomena.

Characteristics of Genetic Method

1. It involves a longer segment of life.

2. It is concerned primarily with the developmental changes over a considerable period of time.

3. It is more generally concerned with the developmental process of normal and natural life.

Longitudinal and Cross-sectional Approach

The genetic method may take two different forms—longitudinal and cross-sectional.

Longitudinal Technique. It is a kind of extended case study. It consists in making repeated observations or measurements of the same child or of the same group of children over a relatively long period of time. It is generally considered more acceptable than the cross-sectional because it has the advantage of continuity and permits the recording of individual fluctuations which are frequently of greater interest than the overall growth pattern itself. The time factor poses a special problem. The maintenance of cooperation on the part of the subjects and the loss of subjects over long periods of time also present difficulties. The time problem can, of course be solved by conducting genetie studies through records, if adequate records have been kept.

Cross-sectional Approach. This consists in a series of parallel case studies, not conducted so much to understand the individual case as to discover common factors among particular levels of children. For example, in this technique, we measure at one time the height of children in the first five grades whereas in the longitudinal technique we wait for the pupils to grow in height through a period of five years. A cross sectional approach consists of taking random samples of children of successive ages as the basis for dëveloping growth norms. This technique is particularly vulnerable to the sampling problem so that fairly large sample would have to be used at each of the successive age levels in order to provide valid data.

Evaluation of Longitudinal and Cross-sectional Approaches.

The longitudinal type of genetic research is quite common but it is being applied more in the clinics and laboratories than in schools. The cross-sectional is a more common type of approach in education whereby the stages of development reached by different age groups of children are studied and compared simultaneously. The longitudinal approach, however, has certain values which are lost in the cross sectional approach inspite of the advanced sampling procedures available for use. The former simplifies the statistical problems immensely and often results in some unique discoveries. It is sometimes possible to combine the two approaches by having, for example, four overlapping groups at two-year intervals. In this way, one might conduct in two years a study that would normally take eight, and at the same time, validate each sample, one to the other, at the point of overlap.

Cross-sectional studies usually describe fewer growth factors than longitudinal studies, but they include more subjects. In a cross-sectional study you might measure the weight, length. girth, etc. of several thousand students between twelve and sixtreen years of age. In a longitudinal growth study, you would probably observe fewer subjects and measure more variables.

Sampling problems occur in the use of both techniques. In cross-sectional studies, the different subjects measured at each age level may not be comparable, for example,a cross-sectional study of the strength and intelligence of males between fifteen and sixty-five years of age. The data are not comparable for two reasons. The older men are presumably representative of those who at fifteen possessed the physical and intellectual capacity to survive until sixty five years of age. The fifteen year old group undoubtedly contains some boys who will not survive until they are sixty-five. Longitudinal studies being confined to fewer subjects may give accurate measurements for the growth of the individuals studied, but these descriptions are not necessarily representative of the total population. Another complication of the longitudinal method is that the researcher usually cannot make improvements in his technique as his study develops without disrupting the continuity of procedures. For example, after some time he may discover a better tool for measuring an aptitude. but if he introduces it, he may not justifiably be able to make comparisons between the data collected by the different tests. Longitudinal studies covering a small number of subjects are not likely to give as accurate a picture of the great range of individual differences that exist among children as cross-sectional studies do. But individual variability of growth and development is revealed better in longitudinal than in cross-sectional studies. Cross-sectional studies provide only approximations about the individuality of growth with time. Thus, the growth spurt during adolescence may not be revealed in a cross-sectional study, because the combination of late-and early-maturing subjects tends to smooth out the curve. Children mature at different rates, and their growth patterns reflect the influence of illness and environmental experiences that they encounter. Hence, the longitudinal method is the best way of obtaining accurate descriptions of individual growth.

When utilizing the longitudinal technique, however, a researcher encounters difficulties of another kind. Some subjects become unavailable due to death, illness, movement etc., and the conditions that made them unavailable may have a bearing on the growth patterns being studied, which cannot be reflected in the last stages of the study results. If strength is being measured, e.g., the weaker boys may lose interest in the study and refuse to take the tests after the first few years. If all data for subjects with incomplete measurements are discarded, as some investigators suggest, the size of the sample may be reduced to a point of little value. The alternative, of course, is to start with a group considerably larger than will be reported in the results. This procedure, obviously, is exceedingly costly and time consuming. Problem solving by the use of the longitudinal approach, therefore, requires extensive facilities, considerable financial support, and continuity of personnel over a number of years.

Limitations of Genetic Method

1. The major weakness of genetic studies is that they give growth patterns that represent the average of the group and apply, therefore, only indirectly to the individual case. In physical-growth curves, e.g., there is no place where the pre-adolescent spurt in growth is shown, simply because it is neutralized from one person to the other—with the result that the over all pattern is erroneous and misleading.

2. Another weakness is that, though some attempt at theory construction in the science of development has been made, the approach so far has been essentially empirical in nature. There is need to move on towards a science of growth and development. Science is concerned with the relationship among phenomena rather than simply with their existence ; to note the status over the years and to develop a set of norms may be valuable, but it is only a preliminary step in the development of science which would be more concerned with the prediction and the control of the growth pattern.

Comparison between Case Study and Genetic Method

	Case Study	*Genetic Method*
1. Main Purposes	1. Studying problem cases or abnormal situations for purposes of diaguosis & remedy. 2. Studying normal situations to serve as the basis of preventing difficulties.	1. Studying the pattern of change & growth of phenomena over a long period of time. 2. Discovering principles underlying the development of phenomena. 3. Securing age-grade norms. 4. Determining changes in interests, abilities & other traits.

	Case Study	*Genetic Method*
2. Types of cases	Four types of cases (Normal as well as abnormal) i) Individuals ii) Groups iii) Institutions iv) Times	Four types of cases i) Group of individuals over a long period of time. ii) Different groups of individuals representing different stages of development. iii) Social Institutions, and iv) Practices over a period of time.
3. Tools employed	i) Study of document ii) Observation iii) Interview iv) Questionnaire v) Psychological measures vi) Social answers.	i) Physical measures ii) Psychological measures iii) Study of documents iv) Interview v) Observation.
4. Areas of study	i) Diagnostic ii) Remedial iii) Comprehensive	i) Longitudinal ii) Cross-sectional
5. Type of control	Chiefly uncontrolled observation	Controlled & uncontrolled observation.
6. Major Steps	i) Determining the status ii) Formulating the hypotheses iii) Detemining antecedents iv) Verifying hypotheses	i) Determining the pattern of investigation—longitudinal or cross-sectorial ii) Studying the phenomenon according to the pattern iii) Analysis & interpretation of findings iv) Calculation of age-grade norms.

	Case Study	*Genetic Method*
	v) Validation of diagnosis through remedial work.	v) Reporting the study
7. Main Requirements	i) Selection of significant cases ii) Sympathetic & humane attitude iii) Insight into human psychology iv) Objective outlook	i) Perseverence in the case of longitudinal studies. ii) Careful selection of representative samples in cross sectional approach.
8. Typical forms of stating results.	Individual case histories.	Growth norms.

NINETEEN

Some Tools and Techniques of Research

There are a large number of tools and techniques available for data collection in research. Some of them have already been discussed and some more are being described in the present chapter.

INQUIRY FORMS

The term inquiry form is a general classification of data-gathering devices in which the data are obtained from the respondent in written form. The inquiry form stands for a list of inquiries to be made from the respondent by the investigator. When this form is administered by mail, it is referred to as a questionnaire. When it is filled out in the presence of the questioner, it is usually referred to as a schedule. When its purpose is to gather opinions rather than facts, it is often known as an opinionnaire or attitude scales. Questionnaire and attitude scales have been discussed in detail earlier. Schedule and opinionnaire are being discussed now.

SCHEDULE

Schedule is the name given to a list of questions to which responses are obtained from the respondent by the investigator in a face-to-face contact. It is the name usually applied to a set of questions which are asked by the interviewer from the interviewee. A schedule is different from a questionnaire in that it is administered personally to respondent or a group of respondents while the questionnaire is usually sent by mail expecting return of responses by mail. Also a schedule is different from an interview because it is only a part of the interview and not the whole of it. The pre-planned questions to be asked by the interviewer is only one part of the total process of interview. The interview is a vast process than mere asking the enlisted questions. In an interview, the interviewer may have to ask many more questions than he has pre-planned to ask, he may have to put them in a form different from his pre-planned form, he may have to engage the respondent in conversation than asking him planned questions or he may have to face cross questions from the respondent.

The advantages this tool has over the questionnaire are that it provides opportunity to establish rapport, to explain the purpose and to explain the meaning of items that may not be clear, and the economy of time and expense. In addition, it may provide almost all complete and usable returns. These are all the advantages that a questionnaire administered by mail cannot provide.

But schedule suffers from some handicaps also. The individuals who possess the desired information cannot always be contacted personally, either for an interview or for completing a personally administered schedule. There are times when a personal contact would be too expensive or time-consuming. In such cases the substitutes which can be used with advantage in place of the schedule are the mailed questionnaire or check-list.

The characteristics of a good schedule, the ways of constructing a good schedule and the analysis & interpretation of the data gathered through a schedule are not very different from those af a questionnaire. Its administration in a face to face situation is, however, different from the administration of questionnaire, which is to be done by the investigator as he would ask his questions in an interview.

OPINIONNAIRE

Anna Anastasi—"Opinion polling or opinion guaging represents a single-question approach. The answers are usually in the form of 'yes' or 'no'. An undecided category is often included. Sometimes large number of response alternatives is provided."

The terms opinion and altitude are not synonymous though they are allied terms. Attitude is what a person feels or believes in. In fact it is the inner feeling of an individual which is difficult, if not impossible to describe. Opinion is what a person says on certain aspects of the issue under consideration. It is the outward expression of an attitude held by an individual. His attitude can be inferred or estimated from his statements of opinions.

An opinionnaire is defined as a special form of inquiry used by the educational researchers to colleet the opinions of a sample of population on certain facts or factors the problem under investigation. These opinions on different facts of the pioblem under study are further quantified, analyzed and interpreted.

Characteristics. The opinionnaire makes use of statements or questions on different aspects of the problem under investigation. It solicits responses on either a three-point scale or a five-point scale, e. g. agree-undecided disagree in the case of three-point scale and strongly agree—agree—uncertain—disagree—strongly disagree in the case of five-point scale. It uses the favourable or unfavourable statements on different aspects of the problem in hand. It may be subdivided into sections. The gally poll ballots generally make use of questions instead of statements. The public opinion polls generally rely on personal contacts rather than mail ballots.

Purposes. Opinionnaires are usually used in researches of the descriptive type, which demand survey of opinions of the concerned individuals.

Public opinion research is a well-known example of opinion survey. Opinion polling enables the researchers to forecast the coming happenings in successful manner.

Illustrations. The following statements are from the opinionnaire on the reforms in educational administration introduced in Andhra Pradesh during 1956—66.

1. Democratic decentralisation has helped to develop democratic values and practices in rural people. A U D
2. There has been consequent improvement of educational standards. A U D
3. Specialized subject inspectorate is better than panel type of inspectorate. A U D
4. Inspection stripped of administrative powers does not help much. A U D
5. Primary education should be brought under a separate directorate as was done in some states. A U D

SOCIOMETRY

Sociometry is a technique for describing social relationships that exist between individuals in a group. It attempts to describe attractions or repulsions between individuals by asking them to indicate whom they would choose or reject in various situations. Children in a class may be asked to name the child, or several children in order of preference that they would invite to a party, eat lunch with, sit next to, work in science laboratory with, have as a roommate or have as a close friend. This technique is primarily employed for obtaining data on social interaction among classmates or group members.

The sociometric technique is used to reveal group structures by showing preferences that persons in the group have for each other, and the way in which individual persons are chosen or preferred, or ignored or rejected. It may be described as a means of presenting simply and graphically the entire structure of relations existing at a given time among members of a given group. It is also used to correlate leaders or isolates with various personality traits and to compare sociometric patterns before and after experimental treatments have been introduced to change them.

Designed by J. L. Moreno and H. H. Jennings *Sociometry* is a tool to measure social-distance. It is the study and measurement of the social choices that people make.

Sociometric studies have been made of many types of social groups including classroom groups. It involves rating by peers rather than rating by superiors. This technique has been used on dormitory residents, eamp groups, factory and office workers, military combat units and entire communities. The United States Air Fore has used sociometry to study the nature of leadership in various situations. For example, the following question was used in a study of air combat crews : "What member of the crew would you select, disregarding rank, as the most effective leader if your plane were forced down in a remote area ? Name three, in order of your preference."

In a classroom situation, each member of a group consisting of forty stndents may be asked to write his first, second and third choices about some significant and pertinent type of social setting. The questions may be like this :

1. Whom would you like to sit next to you on the desk ?
2. With whom would you like to work in the science laboratory ?
3. Whom would you like to be the monitor of your class ?
4. With whom would you like to share your lunch ?
5. With whom do you enjoy most ?

In some sociometric studies negatively phrased items are also used. For example, the children are asked, "Whom would you not like to play with in the playground ?" and are expected to name the individuals in order of rejection. Positive items attempt to describe attractions between individuals and negative items attempt to describe repulsians between individuals. The data received in response to the choice situations provided is tabulated in the form of a *sociogreen* or *sociometric matrix* which serve as the basis for analysis. One widely used procedure is to count the number of times an individual is chosen, disregarding the order of choice. This is the most simple method. But the objection has been raised that it is insensitive, for it does not distinguish between a first and third choice. Another procedure is to score a first choice three points, a second choice two points, and a third choice one point.

Sociometric choices may be represented graphically on a chart known as a sociogram. There are many variations of the pattern of a sociagram. In constructing a sociogram, boys may be represented by triangles and girls by circles. A choice may be represenfed by a single-pointed arrow, a mutual choice by an arrow pointing in opposite directions. Solid cannecting lines show acceptance and broken lines show rejection. Those chosen most often are referred to as stars, those not chosen by otaers as fringers, isolates, or neglectees. Those rejected by most of the members of the group may be referred to as rejectees. The sociogram also depicts social sub-groupings, cleavages and cohesiveness. Small groups made up of individuals who choose one another are cliques. The symbols of those chosen most often are placed nearest to the centre of the diagram, the ones chosen less often progressively outward. Those not chosen by others are literally on the outside.

The dota of the choice situations are tabulated in the form of a *sociometric matrix*. The design of this matrix is illustrated below :

Q. Whom would you like to be the monitor of your class ?

Chosen→	A	B	C	D	E	F	G	H	I	J
Chooser ↓ A			2		1			3		
B				1		2			3	
C					2		1			3
D		1				2		3		
E	2		1			3				
F	1			2	3					
G		1						3		2
H		3	1				2			
I	3			1		2				
J						1				
First Choice	1	2	2	2	1	1	1			
Second Choice	1		1	1	1	3	1			1
Third Choice	1	1	1		1	1		3	1	1
Total	3	3	4	3	3	5	2	3	1	2

Advantages of Sociometry. 1. It helps us to have an idea of the group at a glance.

2. It enables us to form appropriate groups of students for carrying out various activities and projects.

3. Such tests at differents times enable us to find out the changes taking place in the group structure.

4. It gives an insight into the qualities of leadership as being appreciated by a particular group.

5. It helps us to compare one gronp with the other.

6. It helps the guidance worker by acquainting him with pupil relationships.

SOCIAL DISTANCE SCALE

According to Robert E. Park—"Social distance refers to the grades and degress of understanding and intimacy which characterise presocial and social relations generally The concept of social distance applies to some continuous ranging from close, warm, intimate acceptance at one extreme to active dislike, hostility and rejection at the other extreme. A subject is asked, for example, to state whether he would accept a certain kind of person as a citizen, as a neighbour or as a member of his family. When the process is carried out with a large group of individuals, it is possible to determine what kinds of persons are acceptable to the group, the order of their acceptability and other information of sociological value.

It was developed by E. S. Bogardus. The scale consists of a number of selected situations (usually seven) ranging from acceptance to rejection. The subjects check their positions with regard to persons or groups studied, by choosing the points on the scale with which they feel themselves in agreement. When the scaled situations are weighted, a quantification of the responses rcceived is reflected by simple or complex mathematical calculations and comparisons are made as and when necessary.

It is illustrated by the following examples. In judging aceeptance of different minority groups. the choices might range between these extremes.

Complete acceptance	I wouldn't object to having a member of this group become a member of my family by marriage.
Partial acceptance	I wonldn't mind sitting next to a member of this group in a bus.
Rejection	I don't think that members of this group should be admitted into our country.

When applied to an indivdual in a classroom situation, the choices might be like this :

Complete acceptance	I would like to have this student as my best friend.

Partial acceptance	I wouldn't mind sitting near this student.
Rejection	I wish this student weren't in my class.

When we adopt a larger number of evenly spaced positions (usually seven in number), the scale is likely to give a more precise measure of acceptance or rejection.

The use of this method of scaling is usually restricted to pilot studies or to researches which for some reason or the other, need to be completed quickly and not require a very high degree of accuracy.

GUESS-WHO TECHNIQUE

Devised by Hartshorne and Mark A. May, this technique is an interesting tool consisting of descriptions of a series of roles played by Individuals in a group. It is closely related to sociometry. The subjects are to name the individual/individuals who fit the verbal descriptions. Significant peer judgements about individual roles are thus revealed through this process of guessing. The children are asked to name the individuals who fit the descriptions given below :

This person is always happy.
This person is very talkative.
This person is always worried.
This person is always finding fault with others.
This person never likes to do anything.
This person is always ready to help others.
This person is always active.
This person never tries to mix with others.

Items of this type yield interesting and significant peer judgements and are useful in the study of individuals. Of course, the names of children chosen should not be revealed.

Q-SORT TECHNIQUE

The Q-sort technique, like the Thurstone method of equal-appearing intervals, involves a sorting process for the purpose of assigning scale values to items. Subjects are given a large number of cards (sixty to one hundred) containing drawings or descriptive words, phrases, or statements that are relevant to the topic under investigation, They are asked to sort the cards into piles, usually nine to eleven, according to their view of the relative standing of the descriptive items along a single continuum, such as, "most like me—least like me", "most important—least important", "most prefer—least prefer." The number of cards that subjects are instructed to place in each pile is usually predetermined by the investigator to form a roughly normal frequency curve.

Below is a distribution of 60 staements. The numbers above the line represent the number of cards to be placedin each pile, The numbers below the line are score values for the cards in the piles. The card in the "most-approved" pile, for example, are each assigned the score value 10 and the 12 cards in the centre pile are each assigned the score value 5.

Most approved											Least approved
Frequency of cards	1	2	4	7	10	12	10	7	4	2	1
Score value	10	9	8	7	6	5	4	3	2	1	0

The Q-sort technique is used to assess attitudes, values, artistic judgements and interests of subjects. It may be used to study intensively the characteristics of one individual or clusters of individuals. The subjects may be assigned one Q-sort or several related Q-sorts. They may be assigned the same Q-sort more than once, such as before and after a training programme to possess the changes that have taken place or to describe perceived self and ideal self in a study of adjustment. It is used to identify clusters of subjects in a group with similar responses and to analyze how the various clusters differ. The Q-sort technique is particularly useful in the exploratory stage of research. It is, however, time—consuming to construct and to sort, it is not appropriate for studies using large numbers of subjects, and one cannot generalize the findings to a population from a Q-sort subject sample.

SITUATIONAL TESTS

Anne Anastasi—Essentially a situational test is one which places the subject in a situation closely resembling or simulating a 'real-life' criterion situation.

Paper-pencil test are considered to be yielding only one side of the picture of the individual. They will not be testing the behaviour of the individual as it were in a natural situation. Hence efforts are increasingly being made to devise situational tests which resemble as if they were in a real-life-situation and measure the behavioural tendencies of the individual.

Of the different types of situational tests some well known are : 'everyday-life tests', 'situational stress tests','artificial-task tests' and so on.

Examples of these are :

(1) Hartshorne and May Character Education Inquiry ;

(2) The School Kit Test ;

(3) Observational Stress Test ;

(4) Self-Concept Tests.

As tools of educational research, these tests have the following limitations :

1. only standardized tests on local population are to be used.

2. training in administration of tests and interpretation of results is essential.

3. establishment yf reliablity and validity for the tests is needed before they can be used with confidence.

VALUE SCALES

Murty—Measurements of values have also gained prominence currently and efforts are made to develop instruments to measure values held by individuals.

Value scales have been developed quite recently. The study of values gained importance because degeneration of modern life and demoralization in public life is attributed largely to the devaluation of values in all spheres of life—political, religious, moral, social, educational, etc.

Value scales are those tools which are useful for measuring the values held by people who come under the jurisdiction of the investigation.

The value scale may have its theoretical framework on the Spranger's type of men : Theoretical, Economic, Aesthetic, Social, Political and Religious or any other suitable type as its basis. It gives final scores that reflect only relative strength in the areas of value under study. It also gives total scores that may be plotted to get a profile of the individuals of whom the values have been measured.

These scales may be used to measure values of the concerned people in the areas like—Religious, Social, Moral, Scientific, Democratic, Humanitarian, Aesthetic, Economic, Cultural, Philosophical, Educational, etc.

A sample item from the Allport—Vernon—Lindzey Study of Values is as under :

The answers are rated in order of personal preferencc, gioing 4 to the most attractive and 1 to the least attractive alternative :

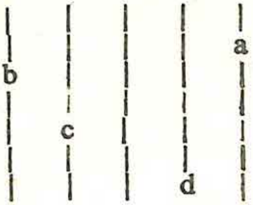
In your opinion, can a man who works in business all the week best spend Sunday in.........

(a) trying to educate himself by reading serious books.

(b) trying to win at golf or racing.

(c) going to an or chestral concert.

(d) hearing a really good sermon.



THE FOLLOW-UP STUDY

The follow-up study investigates about individuals who have left an institution after having completed a programme, a course of study or a treatment. It is concerned with what has happened to them, and what has been the impact upon them of the institution and its programme. By examining their status or seeking their opinions, one may get some idea of the adequacy or inadequacy of the institution's programme. Which courses activities or treatments proved to be of value ? Studies of this type enable an institution to evaluate various aspects of its programme in the light of actual results.

Dillon's study of early school leavers has yielded information that may lead to the improvement of the curriculum, guidance services, administrative procedures and thus the holding power of the American secondary school.

Project Talent was an eduational survey conducted by the University of Pittsburg. It consisted of the administration of a two day battery of aptitude, ability and achievement tests and inventories of the background characteristics of more than four lakhs of students enrolled in secondary schools in America. The purposes were to (i) obtain an inventory of the capacities and potentialities of American youth, (ii) to establish a set of standards for educational and psychological measurement, (iii) to provide a comprehensive counselltng guide indicating patterns of career success, (iv) to provide information on how youth choose their life work and (v) to provide better understanding of the educational experiences which prepare students for their life work.

In addition to the testing programme, questionnaire follow-up studies have been conducted and are plannrd at regular intervals to relate the information gathered to patterns of aptitude and ability required by various types of occupations. The vast amount of data stored in the data bank, now available in the computer files, will make significant educational research possible and may provide a basis for possible changes in the educational patterns of American secondary schools.

One phase of longitudinal study conducted in 1964, involved the follow-up of the ninth grade group who failed to complete the high school programme. It providad an estimate of the characteristics of the dropout population. These data were compared with those of a randon sample of students who graduated. The two samples were compared on a number of characteristics such as academic achievement, participation in extra-curricular activities, work experiences, hobbies, contacts with school counsellors and self-reported personal qualities. The students who graduated scored significantly higher on most of the characteristics, except self-reported qualities of leadership and impulsiveness. A contact has been maintained with the original students and the eleventh-year follow—up survey has been completed. Many of the students expressed dissatisfication with their schooling, and regretted that they had not gone on to college or vocational school and that they had married too early. More than half still live within 30 miles of their high schools. The more mobile half were the high academic achievers.

QUANTITATIVE STUDIES

Quantification has been defined as a numerical method of describing observations of materials or characteristics. When a defined portion of the material or characteristic is used as a standard for measuring any sample, a valid and precise method of data description is provided. Scientists distinguish among the four levels of measuremeant as given below :—

A nominal scale. It is the lowest level method of quantificatton. A nominal scale indicates differences among things by assigning them to such categories as professors, readers, lecturers, research assistants, or instructors and to such subsets as males or females.

Each individual can be a member of only one set and all other members of the set have the same defined characteristics. Such categories as nationality, occupation, educational level or religious affiliation provide other examples.

This simple enumeration or counting is the only feasible method of quantification in some situations and may provide an acceptable basis for statistical analysis.

An ordinal scale. Sometimes it is possible not only to indicate that things differ, but also to indicate that they differ in amount or degree. Ordinal scales permit ordering into more than or less than adjacent things. The criterion for highest to lowest ordering is expressed as relative position or rank in a group : 1st, 2nd, 3rd, 4th......nth. Ordinal measures have no absolute values and the differences between adjacent ranks may not be equal. Ranking spaces them equally though they may not be equally spaced.

An interval scale. An arbitrary scale based on equal units of measurement indicates how much of a given characteristic is present. The difference in amount of the characteristic possessed by persons with scores of 90 and 91 is assumed to be equivalent to that between persons with scores of 60 and 61. The interval scale represents an advantage over nominal and ordinal scales because it indicates the relative amount of a trait or characteristic. Its primary limitation is the lack of a true zero. It does not have the capacity to measure the complete absence of the trait, and a measure of, 90 is not double that of 45. Psychological tests and inventories are interval scales and have this limitation.

A ratio scale. A ratio scale has the equal interval properties of an interval scale but has two additional features. It has a true zero. It is possible to indicate the complete absence of a property. Secondly the numerals of the ratio scale have the qualities of real numbers and can be added, subtracted, multiplied and divided and expressed in ratio relationships. One of the advantages enjoyed by practitioners in the physical sciences is the ability to describe variables in ratio scale form. The behavioural sciences are limited to describing variables in interval scale form, a less precise type of measurement.

Proceeding from the nominal scale (the least precise type) to ratio scale (the most precise) increasingly relevant information is provided. If the nature of the variables permits, the scale that provides the most precise description should be used.

The limitations that have been mentioned are not intended to minimize the significance of quantitative methods. Progress is being made in developing more valid operational definitions and better observation techniques. The quantitative approach is not only useful, but may be considered indispensable in most types of research. It has played an essential role in the history and development of science as it progressed from pure philosophical speculation to modern empirical, varifiable observation.

QUALITATIVE STUDIES

Qualitative studies are those in which the description of observations is not ordinarily expressed in quantitative terms. It is not suggested that numerical measures are never used, but that other means of description are emphasized. When the researcher gathers data by participant observation, interviews and the examination of documentary materials, little measurement may be involved. However, observations may be classified into discrete categories, yielding nominal level data.

In some types of investigation, events and characteristics may appropriately be described qualitatively. Topics such as these may serve as examples :

The influence of the socioeconomic status of a group of high school students in the selection of career goals.

The influence of the home on pupil-teacher relationships.

To conclude we can say that it may be unwise to try to draw a hard—and—fast distinction between qualitative and quantitative studies. The difference is not absolute but one of emphasis. One emphasis should note be conside.ed superior to the other, The appropriate approach would depend upon the nature of the variables under consideration and the objectives of the researcher.

Traditionally, educational research has emphasized the quantitative approach. A substantial number of researchers feel that qualitative studies have, for too long, remained outside the mainstream of educational research. Some investigations could be strengthened by supplementing one approach with the other.

PREDICTIVE METHOD

The bases on which predictions are made range all the way from intuition to relatively precise empirically and theoretically derived relationships. Fortune-telling, for example, is simply guess work made true by selective forgetting. Astronomy, on the other hand, is able to predict the position of a star at any given time in the future with relatively unlimited accuracy.

Prediction is often based on trends. It appeares safe, for example, to predict that the enrollment of our schools will increase in the next decade. Trend prediction is a standard procedure in economics, where business conditions indexes are based on the trend lines of relevant economic indicators. These are sometimes simply graphic extensions of the lines of growth of contributing factors. A more precise technique consists of the line of growth and plotting it further into the future. Some equations of this kind have relatively wide applicability. The Gompertz curve, for example, which displays an initial gradually increasing rate of acceleration, followed by a gradual tapering off to a limit, can be used to represent both population growth and the learning curve in the acquisition of a motor skill. The equation of the straight line is applicable to a number of situations, including perhaps changes in a phenomenon over a short period of time when growth can be assumed to be linear,

Prediction can also be based on the association between variables. For example, to the extent that I.Q. and academic achievement are positively correlated, it is possible to predict with some degree of accuracy, that a person with a high I.Q. will probably do well academically. Such prediction is, of course, not free from exception, since the association between I.Q. and academic achievement is not a one—to—one relationship. Prediction on the basis of association can be extended to more sophisticated and precise conditions, involving formulas of various degrees of complexity, the accuracy of which can be estimated through proper statistical techniques.

The most common basis for informal prediction used in education is performance on educational and psychological tests. By virtue of the correlation of the scores they yield with measures of certain other traits, all tests in a sense are prognostic. Intelligence tests, for example, are proguostic of academic and vocational success. Every test allows for prediction and tests are rarely given for purposes other than prediction. This is implied in the concept of test validity.

At an elementary level, prediction can be based on a simple charting of two variables, such as I.Q. and grades, on a scattergram. A line of *best fit* can then be drawn through the data to display the general trend. This idea can be extended to provide an expectancy table or chart showing expected performance for different I.Q. levels.

The concept of correlation is fundamental to prediction based on association among variables. To be valuable in prediction, the degree of association between two variables must be relatively substantial, and, of course, the greater the association, the more accurate the prediction it permits.

Prediction in the individual case can be based either directly on the individual's past performance or on the assumption that the probability which pertains to the group of which he is a member somehow has a bearing on him. Individual predictions can also be based on a judgemental or clinical approach. Clinical predictions of longevity, for instance, might involve categorizing people into finer and finer sub-classifications. These classifications can be made with respect to sex, age, marital status, occupational status and so on.

PROJECTIVE TECHNIQUES

Ruth Strang says—"Projective techniques are a method of understanding the inner world of the individual." The aims of projective techniques are to elicit, to render observable, and to communicate the psychological structure of the snbject, as inherent to him at any given moment and without study of historical antecedents. An individual projects or reveals his personality in a free and unrestricted activity. According to Murray, the purpose of this procedure is to stimulate literary creativity and thereby evoke fantasies that reveal covert and unconscious complexes. It is based on the fact that when a person interprets an ambiguous social situation he is apt to expose his own personality. The method is designed to penetrate somewhat below the peripheral personality and to disclose latent needs, images and sentiments which the subject would be unwilling or unable to embody in direct communication. It will serve as a sort of screen upon which the subject projects his characteristics, ideas, attitudes, aspirations, fears, worries, aggressions and the like.

"Typically, projective instruments also represent disguised testing procedures in so far as the subject is arely aware of thetype of psychological interpretation which will be mader of his respoinse. Projective techniques are likewise characterised by a global approch to the appraisal of personality. Attention is focussed upon a composite picture of the whole personality rather than upon the measurement of separate traits."

L.K. Frank was the first person to use the term Projective Technique in 1939 although such methods have been in use for many years prior to that.

Projective techniques are very useful with young children, illiterates, persons with speech defects or language handicaps.

Kinds of Projective Techniques

Play Situation. Many dolls representing a father, a mother, a boy and a girl are given to the child to play with and his reactions are observed. These dolls provide the medium through which the child might act out or reveal his thoughts, impulses and feelings about himself and others. Situation is such as to give free play to his ideas at the unconscious level. Controlled play techniques are also used. In a free play, a boy who happens to be afraid of his father might assign no doll to his father or if at all he assigns a doll to him, he tries to make that doll unimportant in his play situation. He may happen to be jealous of his sister. He might assign the roll of the sister to the baby doll and cause it punished by the father doll or mother doll.

Story telling and Story completion. The child may be given an incomplete story and asked to complete it. While completing it, the child is likely to reveal something about his feelings and desires. He will also show his imagination. The presented situation is such which touches the emotional life of the child. For instance, he is asked to relate a story about an innocent child who was beaten by his father. Or the father is about to take him to see a fair. All of a sudden a guest drops in. When the child completes such stories, he is likely to depict his innermost feelings, wishes and thoughts. This method is usually employed in the case of delinquent children.

Incomplete Sentence Technique. This is a simple method. Some incomplete sentences are presented to the child which he completes in his own way. By reading his responses, the counsellor records observations which indicate healthy or unhealthy, positive or conflicting attitudes, etc. Stimuli in the form of the following words may be presented to the child :

Incomplete Sentences	**Completed Sentences**
(a) A baby………	(a) A baby is very lovely.
(b) My friend……	(b) My friend is very poor.
(c) The people……	(c) The people are very clever.
(d) My home……	(d) My home is not good to live in.
(e) My teacher……	(e) My teacher is unkind.

The psychologist, by going through these sentences, may get some clues of the repressed wishes, complexes, likes and dislikes, etc. of the child.

Original Drawings and Paintings. Original drawings and paintings of the child also provide vital information about his personality The theme or subject he chooses, the colour he uses, the length, direction curvature of the lines, open spaces, prominent figures,—all these give an indication of the various traits of the personality of the child.

Dream Analysis. Freud used this method to find out the repressed, unconscious desires, emotions and feelings of individuals. It has been recognised that the dreams have their roots in the person's private world. They do not just happen, they have certain deep rooted causes behind them.

Free Association. In this method, the psychologist first of all develops rapport with the subject and then the subject is asked to take a comfortable position reclining on a sofa and is encouraged to talk about his troubles freely after he is blind-folded. The psychologist or the psyschoanalyst records his responses and interprets them. After many such sittings, it becomes possible for him to describe the personality of the subject.

The Rorschach Test. Rorschach was a Swiss psychologist. He employed ink blots for diagnosing mental disorders. Perceptual approach is the basis of this test. The ink-blots which are not well defined figures are perceived by each individual in his own way, thus projecting his own personality.

Rorschach experimented for years together with thousands of ink-blots and ultimately selected ten which proved to have the highest prognostic value. These are ten ink blots in all, five in black and white, two with splashes of red and three in other colours. These are printed on 7"×9½" cards.

Each card is given to the subject in turn, who is asked to tell what he perceives in each one of them. The counsellor notes whatever the subject says. He then shows the card a second time and through well worded questions he elicits answers. The success of the counsellor depends to a great extent upon his skill in asking questions that will further clarify the free responses. Special techniques and relevances have been developed for recording and interpreting the responses of the subject.

This tool is used for various purposes :

1. It helps to distinguish between normal persons and persons in need of psychiatric treatment.

2. It helps to show the potential intelligence of an individual.

3. It helps to predict and plan for academic success and adjustment in the school and college.

4. It may prove to be helpful in indicating personality characteristics significant for vocational success.

Thematic Apperception Test (*T*.A.*T*.). Murray's T.A.T. involves a systematic use of pictures representing a number of dramatic events. The subject observes the pictures and identifies himself with some picture. In a way, the picture presents a stimulus to the child to talk freely. The child makes interpretations in accordance with his own past experiences and present needs and attitudes. To quote Ruth Strang—"he reads into the pictures his own experiences—the responses made in the test situation also reveal the person's attitudes and ways of thinking in life situations."

The pictures of the T.A.T. have the following characteristics :

In the *first* place, no detail in the background is provided so that it may not limit the picture to a certain time or place.

Secondly, the themes of these pictures are vague.

Thirdly, the action and expression of the characters in the pictures are not very clear and are rather vague and ambiguous.

Fourthly the contents of the picture, do not convey the whole story. They are incomplete.

Fifthly, home and social situations relate to the ordinary situations of life.

Sixthly, characters in the pictures are such that the child can very easily identify himself with some of them.

The test can be employed suitably to persons over four years of age whose intelligence quotient is not less than eighty. The psychologist presents the pictures and puts questions like these :

What does the picture mean to him ?

What can be the factors that have led to the situation ?

What will be the outcome ?

In interpreting his description of the pictures, it is important to note only the turn of the thoughts the child injects into the situation, but also his mood.

Advantages of Projective Techniques. 1. An individual projects and reveals himself in various situations and sometimes he is not even conscious of the fact. Thus we get reliable information from him.

3. The connection between the situation and the diagnosis is very close.

3. It is not possible for the individual to give readymade or conventional responses as the tasks presented are novel and unstructured.

4. These prompt spontaneous responses.

5. These enable us to have a total rather than a piecemeal view of the personality of the individual.

Limitations. 1. They are very subjective.

2. Only a trained psychologist can administer them, as they require a lot of expertise in their administration.

3. They are time consuming.

4. They are quite difficult to interpret.

5. There are very few projective techniques which are standardised.

Present Status of Projective Techniques. According to Anne Anastasi—"Such devices still represent only raw materials rather than standardired tests. As such, they may serve as aids to the trained and experienced clinician. In his hands, they may provide effective means of establishing rapport as well as a rich source of leads to be followed in the interview. At the same time, current research such as that of Thurstone and Good enough suggests that the projective approach may eventually be utilized in the construction of instruments which can be properly designated as psychological tests."

TWENTY

Sampling

W.G. Cochran has said—"In every branch of science we lack the resources to study more than a fragment of the phenomena that might advance our knowledge." For studying any problem, it is difficult to study the whole population or universe. Studying the entire universe is not viable in many ways. It is therefore convenient to pick up a sample out of the universe proposed to be covered by the study. But sampling needs much care.

The primary purpose of research is to discover principles that have universal application. The investigator is concerned with the generalizability of the data beyond that of the immediate sample. To study a whole population in order to arrive at generalizations would be impracticable. Some populations are so large that their characteristics could not be measured ; before the measurement has been completed the population would have changed.

Fortunately, the process of sampling makes it possible to draw valid inferences or generalizations on the basis of careful observation of variables within a relatively small proportion of the population.

Bloomers and Lindquist—"A large majority of the research studies in Education and Psychology, or for that matter, in many other fields, are of a type known as sampling studies. In such studies, measurements or observations are made of a limited number or sample of individuals or objects in order that generalisations or inferences may be drawn about still larger groups or populations of the individuals or objects that these samples are supposed to represent."

Until recent years, relatively little attention was given to the problem of how to draw a good sample. This does not matter so long as the material from which we are sampling is uniform, so that any kind of sample gives almost same results......But when the material is far from uniform, as is often the case, the method by which sample is obtained is critical, and study of techniques that ensure a trustworthy sample becomes important. In fact sampling is a part of the strategy of research and has by now acquired the status of a technical job.

SOME IMPORTANT DEFINITIONS

In order to develop a clear understanding of the theory and process of sampling, it is essential to know some important definitions of the relatad terms.

Population. By population we mean the aggregate or totality of objects or individuals regarding which inferences are to be made in a sampling study. It means all those people or documents, etc., who are proposed to be covered under the scheme of study. A population is any group of individuals that have one or more characteristics in common that are of interest to the researcher.

Sample. A sample is a small proportion of a population selected for observation and analysis. It is a collection consisting of a part or subset of the objects or individuals of population which is selected for the express purpose of representing the population. By observing the characteristics of the sample, one can make certain inferences about the characteristics of the population from which it is drawn.

Sampling. It is the process of selecting a sample from the population. For this purpose, the population is divided into a number of parts called sampling units.

Parameter. A parameter is a population fact which depends upon or is a function of the scores for all the population units. It is the population value representing any trait or characteristic of the population as a whole.

Statistics. A statistic is a sample fact which depends upon the scores of the particular sampling units comprising a sample. It is the sample value representing any trait or characteristic of the members of the sampling.

Sampling Error. Sampling error is simply the difference between the value of parameter and that of corresponding statistic or the difference between population value and sample value.

Sampling Distribution. The sampling distribution is the relative frequency distribution of an infinity of determinations of the value of this statistic. Each determination is based on a separate sample of the same size and selected independently by the same prescribed procedure from the same population.

Sampling Bias. If the mean of the sampling distribution of a statistic coincides with or equals that of the corresponding parameter it (the statistic) is said to be unbiased. If, on the other hand, the mean of its sampling distribution does not coincide with the parameter, it is said to be biased.

Standard Error. The standard error of any statistic is the standard deviation of its sampling distribution.

THE SAMPLING THEORY

W.G. Cochran has said—"The purpose of sampling theory is to make sampling more efficient. It attempts to develop methods of sample selection and of estimation that provide at the lowest possible cost estimates that are precise enough for our purpose."

Sampling theory is the underlying factor of all types of sampling techniques and methods. As a consequence of this theory, sampling techniques have attained a level of reliability and validity in research. Sampling theory forms the basis of the method of investigation by sample. It guides in the selection of a part to represent the whole of a population.

Sampling theory has been developed during the last few decades as a result of the development of survey techniques which involve sample surveys.

A knowledge of this theory is essential for the prospective researcher in order to enable him to carry out his research after drawing samples from the population in a precise manner and an adequately representative fashion.

The theory enables prediction of characteristics of the population on the basis of the study of samples. The theory ensures precision at the minimum cost.

On the assumption that the purpose of a particular study is to draw inferences about the population, certain important theoretical issues need to be considered. If all the members of a population were included in a study, there would be no need for statistical inferences because the mean of this group would be the population value. Typically it is impossible to have available all members of a population, so that one is forced to draw samples from the population and, on the basis of these samples, estimate the population value.

Having drawn a sample and computed the desired descriptive statististics, it is possible to determine the stability of the obtained sample value, i.e. accuracy in the estimate of the population value. The primary question here concerns the amount of fluctuation of the statistic to be expected from sample to sample and is dependent upon such factors as the sample size (the larger the sample, the less fluctuation) : the statistic employed (the mean being the most stable measure of central tendency) ; the degree of variation of the attribute measured existing in the population (the greater the inter individual variation, the greater the probability that extreme cases will occur in any particular sample). The amount of fluctuation or variation of a sample statistic is called the standard error of the statistic' For a constant sample size it is clear that as the variation among individuals increases, so will the variation among sample means and thus the standard error. This is entirely logical in that the greater the magnitude of the deviations from the mean, the greater the chances of their influencing the value of the sample mean. The denominator term in Standard Error of the Mean $(=\text{S.D.}/\sqrt{N})$, shows that as the sample size increases, the variation of successive sample means will decrease. Obviously, this is the case, because larger samples incorporate more members of the population, whereas smaller samples permit greater sampling errors.

BASES OF SAMPLING

The choice of a sample as representative of the whole group is based upon the following assumptions :

1. **Underlying homogeneity amidst complexity.** Although educational phenomenene appear to be very complex in nature, so that no two stndents are alike, a keener study has disclosed that beneath this apparent diversity there is underlying fundamental unity. Fundamentally speaking, the students are similar in many respects so that a study of some of them will throw significant light upon the whole group. Thus the units or samples selected have likeness or similarity with other units to make the sampling more scientific.

2. **Possibility of representative selection.** It has been shown that if a certain number of units are selected from a universe on purely random basis, every unit will have chance of being included and the sample so selected will contain all types of units, so that it may be representative of the whole group. Each unit has an equal probability of being included in the sample. The sample data can adequately represent the census.

3. **Absolute accuracy not essential.** The researcher must work with the idea that the study which he is conducting does not require absolute and cent per cent accuracy. In large scale studies we have to depend upon averages and estimates which are considered as fairly significant in an inquiry. It is not the absolute accuracy that is needed but relative or significant accuracy. The results of sampling studies turn out to be sufficiently accurate to permit valid generalizations.

IMPORTANCE OF SAMPLING

The sampling method was used in social sciences research as early as in 1754 by A.L. Bowley. Since then the method is increasingly being utilised. This technique has now made many a studies possible.

1. When the population is very large, it can be satisfactorily covered through sampling.

2. It saves a lot of time, energy and money.

3. Especially when the units of an area are homogeneous, sampling technique is really useful.

4. When the data are unlimited, the use of this method is really useful.

5. When cent per cent accuracy is not required, the use of this technique becomes inevitable.

6. When the number of individuals to be studied is manageable, intensive study becomes possible.

ADVANTAGES OF SAMPLING

Cochran has enlisted four advantages of sampling :

1. **Reduced Cost.** If the data are collected for the entire population, cost will be very high. It is economical of cost when the data are collected from a sample which is only a fraction of the population.

2. **Greater Speed.** The use of sampling is economical of time also. Sampling is less time consusing than the census technique. Tabulation, analysis, etc. also take much less time in the case of a sample than in the case of a papulation.

3. **Greater Scope.** Complete enumeration of all units of the population are not only most often impracticable, but they require highly trained personnel and sophisticated equipment. Sample simplifies things and personnel with a little training can collect and handle the data. There is greater scope and flexibility of studies when a sample is used.

4. **Greater Accuracy.** Sampling ensures completeness and a high degree of accuracy due to a limited area of operation. In dealing with a sample, the volume of work is reduced, therefore careful execution of field work is possible. The processing of the data is also done more accurately, which in turn produces better results.

Apart from these, there are a few more advantages also.

5. **Organisation of Convenience.** Sampling involves very few organisational problems. Due to small numbers, it does not require vast facilities. It is economical in respoct of resources. The space and equipment required for this study are very small.

6. **Intensive and Exhaustive Data.** As the number is limited, therefore it is possible to collect intensive and exhaustive data.

7. **Suitable in limited resources.** In every society there are more problems and less resoures, particularly when the people are poor and problems uncountable. This is the method which enables the researcher to work even with limited resources.

8. **Better rapport.** Usually it is difficult for the researcher to establish rapport with the respondents when they are large in number and many studies fail for want of good rapport between the researcher and the respondents. As the population of the study increases, the problem of rapport also increases. But in a manageable sample it is possible for the researcher to establish this meaningful rapport.

9. In a small sample, it becomes possible to scrutinise the data collected.

DISADVANTAGES OF SAMPLING

1. **Chances of bias.** The most common argument against the sampling method is the fact that it may involve biased selection and

thereby lead us to draw erroneous conclusions. A bias in the sample may be caused either by faulty method of selection of individuals for the sample or the nature of the phenomena itself.

2. **Difficulties in selecting a truly representative sample.** The results of a sample are accurate and usable only when the sample is representative of the whole group. Selection of a truly representative sample is very difficult particularly when the phenomena under study are of a complex nature. A number of reasons stand in the way of selecting good samples.

3. **Need for specialized knowledge.** The sampling method cannot be used by everybody. It requires a specialised knowledge in sampling technique, statistical analysis and calculation of probable error. In the absence of such knowledge, the researcher may commit serious mistakes.

4. **Changebility of Units.** If the units of the population are not homogeneous, the sampling technique will be unscientific. Although the number of cases is small, it is not always easy to stick to the selected cases especially in social sciences research. The cases of the sample may be widely dispersed. Some of them may refuse to cooperate with the researcher, and some others may be inaccessible. Because of these difficulties, all the cases may not be taken up. Sometimes the selected cases may have to be replaced by other cases. All this introduces a change in the stipulated subjects to be studied.

5. **Impossibility of Sampling.** Sometimes the universe is too small, or too heterogeneous so that it is not possible to drive a representative sample. In such cases census study is the only alternative. In the studies, where a very high standard of accuracy is expected, the sampling method may be unsuitable. Even if the sample is drawn most carefully, there are always some chances of error.

CHARACTERISTICS OF A GOOD SAMPLE

1. A good sample is one which, within restrictions imposed by its size, will reproduce the characteristics of the population with the greatest possible accuracy.

2. It should be free from error due to bias or due to deliberate selection of the unit of the sample.

3. It should be free from random sampling error. It should not be selected by a procedure where there is a connection between the method of selection and the characteristic under consideration.

4. There should not be any substitution of originally selected unit by some other more convenient in any way.

5. It should not suffer from incomplete coverage of the units selected for study, i.e. it should not ignore the failures in the sample in responding to the study.

6. Relatively small samples properly selected may be much more reliable than large samples poorly selected. But at the same time it is

very essential that the sample is adequate in size so that it can become really reliable.

7 In the samples only such units should be included, which, as far as possible, are independent.

8. While constructing a sample, it is important that measurable or known probability sample techniques are used. This will substantially reduce the likely discrepancies.

STEPS IN SAMPLING PROCEDURE

W.C. Cochran speaks of the following principal steps in Sample Survey, which should be remembered and adopted by a research worker :

1. **Statement of the objectives of the study.** The objectives of survey research are to be stated in clear terms at the very outset. Then it is possible and convenient to plan a research project to embrace all of the contemplated objectives without losing sight of any one of them.

2. **Definition of the Population to be Sampled.** The population to be sampled is the population about which the researcher is attempting to obtain information. This population should be clearly demarcated and defined.

3. **Determining the Data to be collected.** The third step involves the task of determining the data to be collected on the sample so defined. The relevant data should be clearly determined taking care to omit all irrelevant data.

4. **Methods of Measurement.** The methods of data collection are obviously dependent on the data to be collected. It should be collected by using the appropriate tools, devices and so on.

5. **Choice of Sampling Unit.** This step refers to the choice of the sampling unit. For this purpose, the whole population is to be divided into parts known as sampling units, which are non-overlapping. The construction of a complete list of sampling units, sometimes called a frame is the major activity in this step.

6. **Selection of a Sample.** This step involves the size of the sample, estimate of the cost of survey and so on.

7. **Organisation of field work.** It involves getting the returns back from the sampling population, supervision of the work, checking of the quality of returns, planning to handle non-responding subjects, etc.

8. **Summary and Analysis of Date.** It involves editing of the completed responses, amending the recording errors, deciding the tabulation procedures, tabulation and estimation of performances.

9. **Information gained for future surveys.** Any of the additional information obtained from the sample may be recorded for guidance in future surveys. The record of mistakes committed this time may also be of immense help to avoid their recurrence in future surveys.

METHODS OF SAMPLING

Bloomers and Lindquist have said—"In general sampling schemes may be classified according to two types :

(1) those in which sample elements are automatically selected by some scheme under which a particular sample of a given size from a specified population has some known probability of being selected ; and (2) those in which the sample elements are arbitrarily selected by the sampler because in his judgement the elements thus chosen will most effectively represent the population."

Probability and non-probability sampling. Hence according to them, there are two chief methods of sampling : (1) *the probability sampling*, and (2) *the judgement sampling*. The former is largely the method in educational and psychological research because it is most amenable to the development of any theory regarding the magnitudes of sampling errors which may be expected in a given situation. In the former randomness is the fundamental element of control. Such designs permit the specification of the precision that is obtained, and the number of cases necessary to provide the required precision. Non-probability designs, on the other hand, derive their control from the judgement of the investigator. For example, a pollster may be instructed to interview 100 persons passing a certain street corner, or to contact by phone so many storekeepers, so many housewives or so many clerks. In non-probability sampling, the cases are selected on such bases as availability and interviewer judgement. Frequently, randomness is erroneously assumed to follow from the stratification of the population into relevant sub-populations. The advantage of non-probability designs lies largely in the area of convenience, which-alongwith the extra sample size sometimes possible for the same cost—is felt to compensate for the relative risk of possible bias. Commercial polls, for instance, frequently claim—with some degree of empirical justification—that the increase in the precision of probability sampling over non-probability sampling is too small to warrant the extra cost of a random sampling design. The fact that the actual selection is done by experienced field workers is obviously reponsible for their relative success. Frequently, on the other hand, such samples are over-weighted with the cooperative, the available and so on. They depend too exclusively on uncontrolled factors and especially on the invesiigator's insight, and there is no statistical procedure permitting the determination of the margin of sampling errors.

At times it may be possible to combine probability and non-probability sampling. This is, of course, a complicated procedure, which calls for a somewhat greater understanding of statistical procedures than the average student is likely to possess. It must also be remembered that complicated sampling designs are very frequently costly, and the greater precision may be obtained for a given cost by simply taking a larger sample of a standard variety.

Radomness. The concept of randomness has been basic to scientific observation and research. It is based upon the assumption that, while individual events cannot be predicted with accuracy, aggreagatr events can. The hungry the mob, the greater the apparent anarchy. It is the supreme law of unreason. Whenever a large sample of chaotic elements are taken in hand and marshalled in the order of their magnitude, an unsuspected and most beautiful form of regularity proves to have been latent all along.

Randomization has two important applications in research :

1. Selecting groups of individuals for observation that are representative of the population about which the researcher wishes to generalize.

2. Equating experimental and control groups in an experiment. Assigning individuals by random assignment is the best method of providing for their equivalence.

Simple, unrestricted random sampling is the simplest (probability) sampling design, calling for nothing more than selecting the required number of cases at random from the specified population. It is important to note that a random sample is not necessarily an identical representation of the population. Characteristics of successive random samples drawn from the same population may differ to some degree, but it is possible to estimate their variation from the population characteristics and from each other. The variation, known as sampling error, does not suggest that a mistake has been made in the process, but that with randomization, certain predicatable chance variations are observed. Randomization is the most fundamental concept which underlies most of the advanced sampling designs.

Various Classifications of Sampling Methods

1. The Simple Random Sampling.
2. Systematic Sampling.
3. Stratified Sampling.
4. Purposive Sampling.
5. Quota Sampling.
6. Cluster Sampling.
7. Double Sampling.
8. Judgement Sampling.
9. Sequential Sampling.
10. Incidental Sampling.
11. Convenience Sampling.
12. Self Selected Sample.

1. **The Simple Random Sampling.** Simple random sampling means that every member of the sample is selected from the total population in such a manner that all members of the population have essentially the same probability of being selected. This is the most

method of sampling. It is considered the most trustworthy method of securing representativeness of the whole population. But it is neither arbitrary, nor careless or haphazard. Random method of selection provides an unbiased cross section of the population.

Ideally, this would require each population member to be assigned a number ; then the sample would be selected from a table of random numbers or some other random selection. Fpr example, if we wished to draw a sample of 50 individuals from a population of 600 students, we could place the 600 names in a container and blindfolded, draw one name at a time until the sample of 50 was selected. Still another --say, to select every third, fifth or tenth person until the sample is completed. 'This approach is also known as sampling from sequential list or sampling by lottery system. Perhaps the best method is to employ a table of random numbers, such as those prepared by Fisher and Yates, Tippett, or Kendall and Babington—Smith. After assigning consecutive numbers in any direction (horizontally, vertically or diagonally). When a number is read that corresponds with that written on a unit card, that unit is chosen for the sample. One continues to read until a sample of the desired size is obtained. In some instances the selection of the sample may be a multistage process, that is, some form of randomization may be performed in several stages of the selection, until the final desired groupings are obtained.

The advantages of random sampling. 1. It requires only a minimum knowledge of the population in advance.

2. It is free of errors in classification.

3. It is appropriate for data analysis which includes use of inferential statisties.

4. It is more representative of the population.

5. It is free from bias and prejudice.

6. The method is simple to use.

7. It is easy to assess the sampling error in this method.

Disadvantages of random sampling. 1. It carries larger errors for the same sample size than are found in stratified sampling.

2. If the units or items are widely dispersed, the selection of sample becomes impossible.

3. If the units or items are heterogeneous in nature or of different size and nature, random sample method would not be applicable.

4. Lack of use of available knowledge concerning the population and lack of knowledge concerning the size of the sample units prior to their selection are some other disadvantages.

5. It is occasionally very difficult to have a completely catalogued universe.

6. Cases selected may be too widely dispersed or even impossible o contact and thus adherence to the whole sample may not be possible.

7. There are instances where the investigator does not want a representative sample. In some studies such as exploratory survey in which the object is to gain insight into the problem – the investigator may choose as his sample only informed persons who can provide him with the maximum degree of insight into his problem.

2. **Systematic Sampling.** It is a variation of the simple random sampling technique. If a population can be accurately listed, or is finite, a type of systematic sample selection will provide what approximates a random sample. It consists of the selection of each nth term from a list of names by selecting a randomly selected name from a randomly selected page. Then every thousandth name would be selected until the sample of 200 names was complete. Systemetic samples of automobile owners could be selected in similer fashion from a state licensing bureau list or file. A sample of eighth grade students could be selected from a school attendance roll over the area. Each member of the sample comes after an equal interval from its previous member. This type of sampling is also called *sampling by regular intervals or sampling by fixed intervals.*

If we compare systematic sampling with simple random sampling, we shall find the following similarities & differences :

1. Systematic sampling provides a more even spread of the members of the sample over the population. This fact leads to greater precision.

2. In simple random sampling, the selection of each member is independent of the selection of the other members. In systematic sampling, this is not the case.

3. Systematic sample is easier and speedier to draw than a random sample and it can be executed without a mistake.

4. If n (the total number) is not an integral multiple of k (the regular interval), systematic sampling may give a difference of one unit. For example suppose N=42 and k=5, if we start with 3 the sample size is 8, but if we start with 2, the semple size is 9.

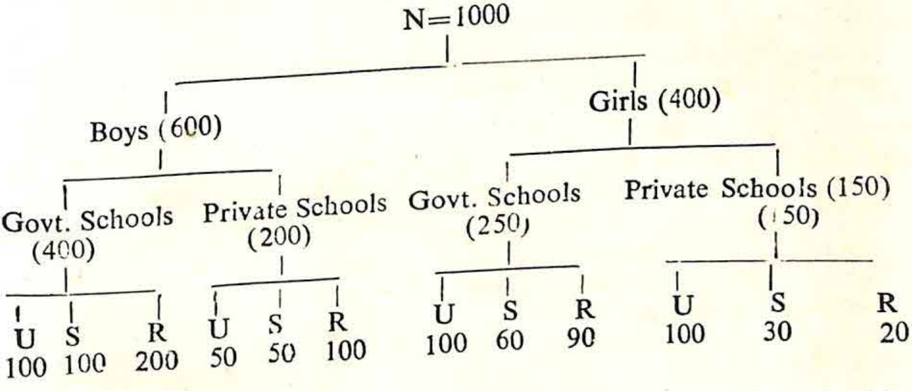
5. Similarly when the list has a periodic arrangement and the sample interval and periodic interval coincide, the sample yields poor results. Suppose husbands and wives are listed in pairs and k=2, if the starting point is 1, only all husbands will be included and if the starting point is 2, only wives will be included in the sample

3. **Stratified Sampling.** Stratified random sampling is a refinemeht of simple random simpling since, in addition to randomness, startification introduces a secondary element of control as a means of increasing precision and representativeness. A stratified random sample is, in effect, a weighted combination of random sub-samples joined to give an over-all sample value. Since a random sample may by chance have an undue proportion of one type of unit in it, it is advisable to use stratified random sampling. The population is divided into smaller homogeneous groups or strata by some characteristic and from each of these smaller homogeneous groups draw at random a predetermined number of units. *Proportional sampling* enables one to achieve even greater

representativeness in the sample. This technique requires one to select units at random from each stratum in proportion to its actual size in the total population. For example for drawing a representative sample from this community in respect of various occupations of the people, we shall have to find out the proportion of each occupational group. If the proportions were 15% professional workers, 10% managers, 20% skilled workers and 55% unskilled workers, the sample should include approximately the same proportions in order to be representative. This method is also called the combination of both random sampling and purposive selection. In the selection of strata or group we employ purposive method, but in selecting actual units from each stratum random method is used.

The usual stratification factors are sex, age, socio-economic status, educational background, residence (rural or urban), occupation, political-party affiliation, religion and race. In the standardization of tests and public opinion polls, the method of stratified sampling is necessary.

The following table provides an illustration of selecting a stratified sample for a total of 1000 cases.



Process of stratifying. Following points may be considered while constructing strata because the success of stratified sampling largely depends on the formation of strata.

1. First of all different variables involved in the study of the problem may be noted. Variables should be selected in a way that they are related to the study. Then the universe has to be divided into strata in the light of these variables.

2. The size of each stratum in the universe should be large enough to provide selection of units on random basis.

3. Stratification should be so constructed that there should be maximum homogeneity in the different units of strata and the units in one stratum should be similar to each other. But they should differ significantly from stratum to stratum.

4. The strata should be clear cut and free from overlapping.

5. It is desirable tnat the number of units selected from each stratum are in the same ratio as the total number of units in the stratum bear to the units in the whole universe. Thus, if the percentage of education in a certain community is 40, the same percentage of units will be selected from amongst the educated.

Kinds of Stratified Sample. 1. Proportional stratified sampling : The number of units to be drawn from each stratum in the same proportion as they stand in the universe.

2. Disproportionate stratified sampling : An equal number of cases are taken from each stratum regardless of the size of strata in proportion to universe.

3. Stratified weighted sampling : It aims at removing the defects of disproportionate sample. An equal number of units are selected trom each stratum and averages are taken from each stratum but they are given weights in proportion to the size of stratum in the whole universe.

Advantages of Stratifed Sampling. 1, In random sample although every unit has an equal chance of being selected, sometimes important units are left out by chance. But under stratified sampling no significant group can remain unrepresented.

2. If a stratum is perfectly homogeneous, selection of even a few cases from it would serve the purpose.

3. Replacement of a unit can be done conveniently if the originally selected case is inaccessible. If a person refuses to cooperate with the survey, he can be easily substituted by another unit from the same stratum.

4. It is possible to select such a sample through stratification that most of the units are geographically localised. A purely rendom sample fails to provide such a control and the cases randomly selected may be very widely dispersed. Concentration of units economises time and cost of survey.

Disadvantages of stratifed sampling. 1. Bias may be caused in the sample through improper stratification owing to overlapping in the strata or disproportionate selection.

2. When the sizes of different strata are unequal, attainment of correct proportion becomes difficult.

3. Lack of accurate information on proportion of population in each category and faulty classification may be listed as some other disadvantages.

4. The task of stratified sampling is itself not so easy, Placing variables in the proper and right strata is not an easy task. It depends on the understanding and knowledge of the investigator.

4. **Purposive Sampling**. Purposive sampling can be considered a form of stratified sampling in that the selection of the cases is governed by some criterion acting as a secondary control. Here the investigator selects a particular group or category from the population to constitute the sample because this category is consideted to mirror the whole with reference to the characteristic in question. He purposely selects and also purposely leaves some members. He selects his units in such a way that the selected sample yields as quickly as possible the same averages and proportions as the totality has with respect to characteristics to be studied. For example, purposive sampling operates when the selected sample is constituted of all the newspaper editors of an area to represent the public opinion of that area. The sample is restricted to units considered by the investigator to be especially typical of the population. Purposive sampling is useful where we want the sample to consist of not very large number of cases. If we want to have a sample of one district or even five districts to represent India purposive sampling is better than random selection.

Purposive sampling is sometimes considered synonymous with stratified sampling. But the two differ in one way. In purposive selection, the units are chosen purposely, whereas in stratified they are chosen randomly.

Since, in this method, it is left to the investigator to decide what to pick up and what not to include in the sample, it becomes essential for him that he does not allow bias to enter into his process of selection.

Samples have to be picked up at different stages. They are not picked up at one stage or at one point of time. The combined average of the sample units selected at different stages and different points of time should be the same as the average of the entire population.

In the purposive sample, different variables should be in the same proportion as they are found in the universe, e.g. proportion of the rich and the poor etc.

This type of sampling is possible only when there is a specific objective. Thus this method need not be used when there are multi-purpose objectives involved in the study. The investigator has to pick up only such sample which is relevant to his study and leave all others so that the purpose of his study is not defeated.

The investigator should possess full knowledge of the universe. It is only then that he will be in a position to decide what is to be picked up and what is to be left out. In case he does not have this knowledge, he will not be in a position to pick up a good purposive sample.

Merits of the method. 1. The sampling is within the complete control of the investigator and as such he can include in his study only such cases which in his considered judgement will make the sample quite representative.

2. The investigator clearly knows the objective of his study. He picks up variables with these objectives in view. Unnecessary variables are dropped out and considerable time and money are saved.

3. In purposive sampling, the purpose of the study can be fulfilled even with a small sample which is picked up purposely and carefully from the universe. In the context of the purpose of the study, a small purposive sample can be a very good representative.

Demerits of the method. 1. In it selection of the sample is completely left to the judgement of the investigator. He is after all a human being and as such bound to introduce his biases in sampling.

2. It is difficult for an average investigator to have full knowledge of the universe as he is supposed to have in this method.

3. In this method, it may not be possible to find out mistakes and inaccuracies till the end, when it may be too late to rectify.

5. **Quota Sampling.** It is another form of purposive sampling and also a form of stratified sampling, except that it refers to a non-propability design in which the investigator, after having stratified his population, uses his judgement rather than randomness in selecting the cases within each of the strata. The number to be selected from each stratum is known as quota. The field worker is generally asked to select the quota according to his will. For example, we wish to conduct an opinion survey on national basis. The first step is to stratify the total area by regions, administrative districts, rural and urban areas, etc. So far it is the same as stratified sampling. The next stage is to select the individuals for interview so as to know their opinion about the issue. Each interviewer is assigned the number of individuals he has to interview, but he is given considerable freedom in choosing those individuals. We can take another example. Suppose a sample of 500 families is to be selected. Under this system the houses to be approached will be decided by stratified sampling and then field workers will be asked to select one family from each house at their will. In order to increase the representativeness of a quota sample and make it more useful, the field worker should be told to contact every fourth house and interview one person till the quota is fulfilled.

Quota sampling would be indicated in an exploratory study where the purpose is to develop insight so that later a more accurate study can be conducted with probability sampling.

Merits of Quota Sampling. 1. Quota sampling is advantageous over probability sampling with respect to convenience.

2. It permits the investigator to substitute one person for another in the case of inability or refusal.

3. It is less expensive and more quick.

4. It is the only practicable method in the case of population for which no suitable frame is possible.

5. Data can be collected qnickly through this sample. It reduces errors that might crop up if interviews or surveys are held over a long period of time.

Demerits of Quota Sampling. 1. The interviewer may be tempted to follow the path of least resistance and may choose to interview people who are easily available and accessible.

2. There remains a danger of bias in the matter of selection.

3. Supervision of the work of interviewers is not possible. There is therefore no surety of the correctness of data.

4. Standard errors cannot be calculated as can be done in the case of a random sample.

5. This method needs several investigators. Each one cannot be equally competent. Thus the results of the study might not be uniform.

6, **Cluster Sampling**. Generally, a sample is selected in units of one. This need not be so, especially in the field of education where it is frequently as easy to contact a whole class as it is to contact a single individual. Cluster sampling is the design in which the unit of sampling consists of multiple cases, e.g., a family, a classroom, a school or even a city or a school system. Rather than listing all elementary school children in a given city and randomly selecting 15% of these students for the sample, a researcher lists all of the elementary schools in the city, selects at random 15% of the clusters of units, and uses all of the children in the selected schools as the sample. It is a variation of the simple random sample, particularly appropriate when the population to be studied is infinite, where a list of the members of the population does not exist, or when the geographic distribution of the individuals is widely scattered. It is also known as *area sampling*, as the selection of individual subjects is made on the basis of place of residence or employment. Some authors consider it synonymous with *multistage sampling* in which the cases to be studied are picked up at random at different stages. For example, if the idea is to study the problems of middle class working couples in a State, the first stage will be to pick up a few districts in the state. The next stage will be to pick up at random a few rural and urban areas for the study. The third stage will come when from each area a few families belonging to middle class will be picked up. The last stage will be that of selecting working couples out of these families. Thus the stages will be :

State → Districts Urban areas. → Middle Class families. → Working Couples in these families.

This method is usually applied when the area to be covered is very wide and it is not possible to study the whole population at one stage. It is agreed, however, that a sample obtained by taking a relatively large number of small clusters is preferable to a sample of equal size obtained on the basis of a small number of large clusters.

Cluster sampling is independent of the other kinds and classification of sampling designs, and one might sample in clusters according to a simple random sampling design, a stratified random sampling design, or any other sampling design.

Merits of Cluster Sampling. 1. It is economical, because it is much easier and less expensive to observe clusters of units in a few schools than randomly selected students scattered in many schools throughout the state.

2. It is particularly attractive from the standpoint of permitting the easy accumulation of large samples.

3. It is adventageous in that the loss of precision per individual case is more than compensated for by the possibility of taking larger samples for the same cost.

4. It is useful because it may combine the advantages of both random as well as stratified sampling.

5. Another advantage of this procedure is the amount of information which may be obtained concerning one or more areas.

Demerits of Cluster Sampling. 1. It may produce a larger sampling error, for each cluster may be composed of units that are like one another, which reduces the representativeness of the sample.

2. It is likely to introduce an element of sample bias because of the unequal size of some of the subsets selected.

3. It may not be possible to apply its findings to another area.

4. An overlapping effect takes place so that the effective number of cases from the standpoint of increasing the precision of the sample is somewhat less than the actual number of cases involved.

The difference between multistage, stratified and cluster sampling has been brought out by the following table :

Stage I	Stage II	Sample Type
Selecting groups	Selecting elements	
Sample	Sample	Two stage random
Complete Count	Sample	Stratified
Sample	Complete Count	Cluster

7. **Double Sampling.** The method of double sampling is known as the two-phase sampling. In this technique a large preliminary sample is drawn and the second sample is taken as a sub sample of the first sample. This two-stage sampling is really a matter of sampling within samples. This type of sampling is involved when the investigator employs both questionnaire and interview methods for data collection. The questionnaire is sent to the entire sample, but field interview is arranged for a few cases in order to ensure the depth and authencity of supplied information or interview may be arranged for those cases who hhve failed to answer the questionnaire. Thus double sampling may help towards deeper information authenticity of information and completeness

of information. In the usual double sampling design, the investigator selects his sample on the basis of a characteristic which is readily available and highly correlated with the primary characteristic for which the collection of data is expensive or difficult. Since the two characteristic are correlated an adequate sample with respect to the second characteristic should automatically also be an adequate sample with respect to the first. Hence one sample is analysed and information obtained is used to draw the next sample to examine the problem further.

8. **Judgement Sampling**. It is one of the non-probability methods of sampling. Probability samples are designed to be representative. Judgement sampling involves the selection of a group from the population on the basis of available information thought to be representative of the total population of the selection of a group by intuition on the basis of criterion deemed to be self-evident. If for any reason in the researcher's judgement, a particular subgroup or stratum is satisfactorily representative, its selection illustrates the principle of judgement sampling, pilot studies could be based on such samples. They furnish the sample of what are known as test cases, or typical cases.'

The chief advantages are the elimination of cost and time in preparing the sample and the ability of the researcher to include certain features of stratification in the sample. Disadvantages include uncontrolled variability and bias in the estimates, strong assumptions based upon thorough knowledge of the population, and elimination of the use of inferential parametric-statistical tools for purposes of generalization. By and large, complete reliance on intuition and hunch is risky.

9. **Seruential Sampling.** This method is being used when two or more samples are taken on a random or purposive basis utilizing the results from analysis of earlier samples to design the later samples or determine if more refined samples are actually necessary. It is an interesting design in which sampling is continued until a significant result on which to base a decision is obtained. It is closely related to sequential analysis, which is a statistical procedure that enables the researcher to test for significance and add observations as he samples, until there is sufficient evidence for accepting or rejecting a null hypothesis. For example, a manufacturer having devised a new light bulb would want to test this bulb for life expectancy before placing it on the market. Since testing the bulb would imply its destruction, he would want to conduct the test as economically as possible. This he might do by testing, perhaps, fifty bulbs. If these proved to be significantly superior or significantly inferior to the conventional bulbs, he would then get his answer. If, however, the test proved to be inconclusive he would then have to add another fifty bulbs for an overall test of one hundred bulbs. If it is still inconclusive the test would be continued by the addition of one batch of fifty bulbs after another until the issue is settled one way or the other.

Sequential sampling introduces an interesting approach to research. Instead of carrying out a study of five hundred cases, it might be advisable to carry, say, a five-stage sequential programme of one hundred cases each. If the first step provides a decisive answer, the study can be dropped immediately. If not, it can be continued until the answer is obtained, or until the five hundred cases are exhausted. In this approach, if any basic flaw were to be noted in the design of the study, the first stage could be considered a pilot study to the others, which would then be condueted on the basis of an improved design.

The greatest advantage of sequential sampling is in reduction of error in the final estimate. This is accomplished through revision of estimates of population characteristics which enable the researcher more efficiently to plan matching and other variables. A second advantage lies in the reduction of the number of observation required in the long run. Several disadvantages are also evident, such as (1) sequental sampling can only be used when a small sample can adequately represent the population and when the number of observations can be increased at any stage of research (2) the analysis of results requires more computation than in random or purposive sampling, and (3) the planning and administration of the design are proportionately more complicated with each sequential analysis.

10. **Incidental Sampling.** Incidental, or sometimes called accidental sampling, is applicable when such groups are used as samples as are easily available, e.g., children in a school, students enrolled in a particular class, members of a club, children of an orphanage or a reformatory etc. The investigator uses these readily available units because he is unable to employ more acceptable sampling methods. The number and conditions of the sample selected are not necessarily suitable for the purpose of the study. This method may be quite acceptable for certain action research projects which do not require generalisations concerning any population other than the sample groups used. Non-parametric statistics may be used in the analysis of results.

Such groups are but poor samples of any definable population and adequate generalizations can hardly be based upon such data.

11. **Convenience Sampling.** It is generally known as careless, unsystematic, accidental or opportunistic sampling. The sample is selected according to the convenience of the sample. He selects certain units convenient to him. No pre-planning is neceesary for the selection of items. The convenience may be in respect of availability of source list, accessibility of the units, etc. Although this method is most unscientific, yet quite a large number of samples are of this very type. A convenience sampling may be used in any one or more of these cases when as the universe is not clearly defined (b) sampling unit is not clear and (3) a complete source list is not available.

Thus the selection of any names from telephone directory contacting any one who may chance to be easily available will come under this type of sampling.

12. **Self Selected Sample.** Sometimes the units of the sample are not actually selected by the investieator, the people offer themselves for

selection. They opt to be included or not to be included in the study. Suppose, for example, an enquiry has to be made about the people's liking for a particular radio programme, and an announcement to this effect is made on the radio asking the people to volunteer themselves to participate in the study. Thus people come forward on their own to act as subjects of the study. In such a case the units are not specifically fixed. Those who care to respond to the ammouncement form the part of the sample.

Conclusion. In summary, it might be repeated that there is no best sampling design; validity of sample data like validity of all data, is a specific concept to be evaluated from the standpoint of the specific case. We must state that the final choice of a sample from a population must depend upon the objectives of the particular problem to be investigated. The investigators of educational problems might most profitably devote their attention lo minimizing possible bias, rather than devising complicated designs.

SIZE OF THE SAMPLE

Apart from representativenesss of the sample another important issue is the size of the sample. There can be no blanket answer for that. Size of the sample depends on the nature of the study, size of the population, sampling design, parameters used, and estimated range of unreliability and an estimate of dispersion of the characteristic under investigation. As an illustration, suppose the researcher decides (i) to use 95% level of confidence, (ii) to accept 1% error, which means that the sample mean does not differ from the population mean by more than ½%. He has found the Standard Deviation of his group to be 10. The sample size (N) can be calculated from the formula $S.E._M = S.D.\ \sqrt{N}$. We know that the value of z for 95% confidence level is 1.96.

$$\therefore\ 1{\cdot}96\ S.E._M = \tfrac{1}{2} \quad \text{or} \quad 1{\cdot}96 \times S.D. = \sqrt{N} \times \tfrac{1}{2}$$

$$\text{or}\quad N = 4 \times (1{\cdot}96)^2 \times (S.D.)^2$$

$$= 4 \times 3{\cdot}8416 \times 100 \quad = 4 \times 384 = 1536$$

Thus 1536 cases should be taken in the sample.

We can calculate the size of the sample for 99% confidence level and 1% error. In this case z-value is 2·58.

$$\therefore\ 2{\cdot}58\ \frac{S.D.}{\sqrt{N}} = 1$$

$$\text{or}\quad \sqrt{N} = 1 \times 2{\cdot}58 \times S.D.$$

$$\text{or}\quad N = 1 \times (2{\cdot}58)^2 \times 100$$

$$= 1 \times 6{\cdot}6564 \times 100$$

$$= 1 \times 665{\cdot}64 = 665{\cdot}64$$

Therefore the adequate size of the sample is 666.

ERRORS IN SAMPLING

Classification of Sampling Errors. Sample data are not representative, can suffer from errors of a *random* and/or a *systematic* nature. These errors can be classified further as errors of *sampling* and/or *measurement*, providing a four-way classification as shown below. Cell A refers to the unavoidable errors that occur whenever sampling is done. If the investigator has decided on a sample of $n = 100$, and has already selected the first 99, the 100th case, selected at random, may be high, low, or

	Random	Constant
Sampling	A	B
Measurement	C	D

average in the trait in question, and will, therefore, cause some shift in the sample statistic. These errors tend to cancel each other, especially if *n* is sizable the sample statistic will tend. to stabilize close to the parameter. Furthermore, not only can these errors be minimized by increasing *n* but their magnitude can be estimated.

Cell B refers to errors of bias in sampling, i.e., sampling errors which do not cancel out but which lean systematically in one or the other direction of the population value. For example, if one were to sample for income by taking every corner house in the city, he would probably incorporate a bias in his data, since people living in corner houses probably draw above average income for them to be able to afford these favoured locations.

Cells C and D refer to errors in measurement, rather than to errors in sampling. Measurement errors are involved in any sampling results, since sampling calls not only for the selection of sample cases but also for the determination of their characteristics. The errors in cell C are those due to the unreliability of the testing. On any measuring instrument, most students are likely to be mismeasured to some degree. These errors cannot be eliminated completely, but they can be minimized even for a given student by basing his score on an extended and comprehensive measuring programme that will permit errors to cancel out. They can be minimized further with respect to sample statistic by having a sizable sample, which permits the self-cancellation of whatever individual errors still remain.

Cell D concerns another bias—that due to systematic errors of measurement. If, in the testing of a sample of students for I.Q. the examiner inadvertently allows an extra two minutes for the test, there will probably be a systematic tendency for the sample statistic to be higher than it should be.

Relative Magnitude of Sampling Errors. From the standpoint of research, the bad errors are the systematic errors—both in sampling and in measurement. The size of random errors can be estimated and they can also be reduced by the simple expedient of increasing the size of the sample and the reliability of the tests used.

The magnitude of random sampling errors can be estimated with the help of standard error of the mean, i.e., $S.E._M = S.D./\sqrt{N}$. Thus, if the average IQ of a sample of 256 cases is calculated, chances are 96 to 4 that a given sample mean will fall within two IQ points of the population mean. If greater accuracy is desired, it can be obtained by increasing either the size of the sample or the homogeneity of the variable under investigation or by using a more adequate sampling design which will decrease the variability of the sampling distribution of the statistic under study.

Systematic errors on the other hand, are difficult to detect. One cannot tell by looking at a distribution whether or not the condition of randomness was fulfilled, nor is there any test of the randomness of sample data. Moreover, the size of systematic errors cannot be estimated since they are outside the scope of statistical theory. To make matters worse, such errors can be very large. For example, non-returns in a questionnaire study may incorporate a considerable bias, the extent and even the direction of which is sometimes difficult to estimate.

When we distinguish between *parameter* and *true value* for a population, that the parameter is probably best conceived as an extension of the sample statistic. As the sample is increased in size to become a complete census—the sample statistic becomes the population parameter. As the sample comes progressively closer to the population, the sample statistic comes progressively closer to the population parameter. If there are systematic errors, however, including more and more of the population in the sample will not correct for such errors, and the sample statistic will stabilize near the parameter, but not near the true value—if we define the true value as an errorless parameter.

If the results obtained are systematically higher and lower than the corresponding true value, the sample is biased and the discrepancy is called an *error of bias*. This is the error which may occur even in the census also. For example, the United States census, despite a complete coverage, may not get a true picture of the actual income of the Americans. In such census coverages, the discrepancies are due almost exclusively to systematic errors of measurement. Bias can also stem from systematic errors of sampling. It does not make sense to increase sample size to reduce random errors, and leave untouched king-sized constant errors.

Random errors can be reduced by increasing the sample size. They are eliminated completely when the sample size is increased to include everyone in the population. Increasing the sample size can also eliminate systematic errors of sampling, since there can be no error of sampling when one no longer samples. This would not, however, eliminate errors of measurement, random or systematic.

TWENTY ONE

Analysis and Interpretation of Data

Good, Barr and Scates write—"Analysis is a process which enters into research in one form or another form the very beginning...It may be fair to say that research consists in general of two larger steps—the gathering of data, and the analysis of these data, but no amount of analysis can validly extract from the data factors which are not present."

Martz has pointed out— "... . bare facts, objective data, never determine anything. They become significant only as interpreted in the light of accepted standards and assumptions, and these standards in the final analysis are not susceptible to scientific determination. In ordinary life we seldom deal with bare facts but facts interpreted. This interpretation or evaluation is determined by the purpose to which we relate the facts."

Francis Rummel has said—"The analysis and interpretation of data involve the objective material in the possession of the researcher and his subjective reactions and desires to derive from the data the inherent meanings in their relation to the problem. To avoid making conclusions or interpretations from insufficient or invalid data, the final analysis must be anticipated in detail when plans are being made for collecting information. The problem should be analysed in detail to see what data are necessary in its solution and to be assured that the methods used will provide for definite answers. The researcher must determine whether or not the factors chosen for study will satisfy all the conditions of the problem and if the sources to be used will provide the requisite data."

The data may be adequate, valid and reliable to any extent, it does not serve any worthwhile purpose unless it is carefully edited, systematically classified and tabulated, scientifically analysed, intelligently interpreted and rationally concluded.

According to Wolfe, "The discovery of order in the phenomena of nature, notwithstanding their complexity and apparent confusion is rendered possible by the processes of analysis and synthesis which are the foundation stone of all scientific methods.

Analysis from the very beginning

When the investigator selects a problem, and begins planning his attack upon it, he at once engages upon an analysis of the total problem in order to formulate a hypothesis which will enable him to start work with some plan, and in order to begin gathering data that will fit in with his hypothesis. One will further analyze the field and his problem in determining the factors for study in the general problem, and he will engage in more analysis when methods of measuring these factors are being considered. The final analysis must be anticipated in considerable detail when plans are being made for gathering data which will reflect the requisite factors, and this calls for analysis of several kinds at the start of one's work. It is the responsibility of the worker to see that his early analysis of his proplem, and of its requirements as it is subsequently developed, is sufficiently valid so that the later interpretation is not built mechanically upon an empty set of facts.

The early analysis is concerned with four things :

1. In the first place, one must analyze his problem carefully to see what is necessary to provide a solution of it. The worker must be able to assure himself and others, that his method of attacking the problem provides a crucial approach.

2. In the second place, one must see that the factors which he chooses for study will satisfy the conditions of his problem—a more detailed step than the first one. He should study enough factors or elements to yield a satifactory answer to his problem.

3. In the third place, one must examine his source of data carefully to see that the factors in which he is interested will have an opportunity to demonstrate themselves. Are the limits which he has set for his source-field (time, area or other limiting conditions) sufficiently broad to permit ample operation of the factors to be studied ? On the other hand, are the limits of the source-field too broad ? Will many spurious factors enter and perhaps cause sufficiently different conditions within the source-field so that the important factors will average out or neutralize each other ?

4. In the fourth place, one must examine the means which he expects to cmploy in gathering data, to see that these means are capable of registering variations of appropriate magnitude, simplicity and at the same time complexity.

VARIOUS STEPS IN ANALYSIS AND INTERPRETATION

The process of analysis, interpretation and generalisation will involve a number of steps :

Organisation. The mass of data collected through the use of various reliable and valid tools, is yet but raw. It needs to be systematized and organised, i.e, edited, classified, and tabulated before it can serve any worthwhile purpose. *Editing* implies the checking of gathered data for accuracy, utility and completeness. *Classifying* refers to the dividing up of the data into different categories, classifications, or subheadings for use. *Tabulating* denotes the recording of the classified material in accurate mathematical terms, e.g. marking and counting frequency tallies for different items on which information is gathered. Tabulation is a tedious and painstaking process, and must be done accurately. The entire raw data should be tested on the basis of the purpose for which they are gathered and only the useful and usable data should be tabulated. Tabulating machines and other mechanical aids to tabulating are coming into use. They are quick and precise but are very expensive or beyond the means of individual researchers.

Analysis. Analysis of data means studying the tabulated material in order to determine inherent facts or meanings. It involves breaking down existing complex factors into simpler parts and putting the parts together in new arrangements for purposes of interpretation. A plan of analysis can and should be prepared in advance before the actual collection of material. A preliminary analysis on the skeleton plan should, as the investigation proceeds, develop into a complete, final analysis enlarged and reworked as and when necessary. This process requires an alert, flexible and open mind. No similarities, differences, trends and outstanding factors should go unnoticed. Larger divisions of material should be broken down into smaller units and rearranged in new combinations to discover new factors and relationships. Data should be studied from as many angles as possible to find out new and newer facts.

When the plan of analysis has not been made beforehand, Good Barr and Scates suggest four helpful modes to start with the analysis of data :

(*i*) To think in terms of significant tables that the data permit.

(*ii*) To examine carefully the statement of the problem and the earlier analysis and to study the original records of the data.

(*iii*) To get away from the data and to think about the problem in layman's terms, or to actually discuss that problem with others.

(*iv*) To attack the data by making various simple statistical calculations.

Common Statistical Methods of Analysis

Most commonly used methods of analysing data statistically are :

Ranks and percentile ranks. A rank is merely the relative position which any particular case occupies in a group. Often it is of more significance than the measurement itself, for it contains a strong comparative element. For example, we are more concerned with the fact that a certain pupil is at the head of his class, than we are in knowing his particular score. The significance of a rank is, of course, in part dependent upon the size of the group ; a rank of ten is near one end of the distribution in a group of 1000, and it is near the other end of the distributlon in a group of 11. To overcome this difficulty, the idea of percentile rank was developed. Percentile rank is essentially the rank that one would have in a group of hundred. A percentile rank of 40 means thot 40%of the group lies below this case.

Measures of Central Tendency. There are several forms of averages, the most common being the *mean*. The *median* and the *mode* are the other common forms of average. The mode does not receive much use in educational problems. The median is popular, in part because of its significance, and in part because it is readily calculated. The mean is mathematically the most significant average and is used most extensively in advanced statistical analysis. But we should avoid the idea that there is any one best average ; each one is best for certain particular purposes and we select the measure to suit the purpose.

Measures of variability. Disperison or variability indicates the spread of the scores. The measure of variability is the most important corrective for too liberal a concept of the average. If one knows the extent of spread in the series, as well as the mean, he is not so likely to overlook the fact that the mean is merely a middle value and is limited in its powers of representation.

The commonly used measures of variability are the *range*, the *quartile deviation*, *the average deviation* and the *standard deviation*. The first is merely the difference between the extremes of the series ; it is not extensively used because the extreme values are very unstable. The average deviation is the average distance out from the mean that the measures lie. The quartile deviation is the semi-inter-quartile range ; the average distance out from the median that half of the measures on either side of the median lie. The standard deviation is the root mean squared deviation. It is a more complex function.

Measures of relationship. Correlation coefficients are common in theses and in many other studies. Correlation is the extent to which an individual tends to be in the same relative position in each of two series. It can be calculated between any two sets of paired measures. A common use of correlation is for prediction ; the higher the degree of correlation, the greater the accuracy with which one can predict a score or other performance in a second series of measures, when the value in the first series is known. Correlation has an extensive use in connection with the critical study of tests and other instruments. The correlation of two series of measures that are supposed to represent the same thing (such as two applications of a standard test, or of comparable forms of it), is known as the *coefficient of reliability*. The correlation of test results with a criterion is known as the *coefficient of validity*.

Error and Probable Error. It becomes important at times to determine whether a change or a difference between any two values, is really caused by some significant factor or whether it is only a matter of chance. If the change (or difference) is equal to only one probable error, then there is nothing much to be said about it; it could easily have been caused by the operation of the chance factors that make results vary. It is not until a difference is equal to about four times the value of a probable error, that one can begin to say with some feeling of certainty that a result is typically different from another. Any difference, that is equal to or greater than four times its probable error is commonly called a *significant difference*.

While analysing their data, investigators usually make use of as many of the above simple statistical devices as necessary for the purpose of their study. There are some other devices of statistical analysis which researchers use in particular experimental or complex causal studies. Some of them are : Testing of significance of differences through *t*-ratio and analysis of variance, chi-square test for testing null hypothesis, calculation of Biserial '*r*' and Tetrachoric '*r*' for finding out causal relationships, calculation of Partial and Multiple correlation for the same purpose and factorial analysis for the purpose of analysing the composition of certain complex phenomena.

INTERPRETATION

The interpretation of research data cannot be considered in the abstract. In view of the diversity of the research methods used in education, and the corresponding diversity of the data they seek, the interpretation of such data is best considered within the context of each of the methods. The analysis and interpretation of historical data, for example, is best viewed in the light of the historical method, its objectives, and its limitations. It is important to note in all circumstances that data do not interpret themselves, and that it is the investigator who must pass judgement on their meaning from the standpoint of the problem under investigation.

The process of interpretation is essentially one of stating what the results (findings) show. What do they mean ? What is their significance ? What is the answer to the original problem ?

Interpretation is by no means a mechanical process. It calls for a critical examination of the results of one's analysis in the light of all the limitations of his data-gathering. It is a very important step in the total procedure of research.

Necessary Precautions in Interpretation

It is important to recognize that errors can be made in interpretation--just as they can in any of the other steps of the scientific method—and the specific errors to be guarded against vary with the different research methods. This step is almost purely subjective, and many errors are made at this point. If, however, one is careful, and critical of his own thinking, he should be able to make satisfactory interpretations. The following are among the more common errors of interpretation which need to be avoided :

1. *Failure to see the problem in proper perspective*. Sometimes the investigator may have an inadequate grasp of the problem in its broad

sense and too close a focus on its immediate aspect. Thus, the Hartshorne and May studies are not to be interpreted as supporting the view that human behaviour is inconsistent and haphazard, but rather that the consistency is internal rather than external.

2. *Failure to appreciate the relevance of various elements.* The investigator may fail to see the relevance of the various elements of the situation due to an inadequate grasp of the problem, too rigid a mind-set or even a lack of imagination. This may cause the investigator to overlook the operation of significant factors. Consequently, the outcomes of the study are attributed to the wrong antecedent.

3. *Failure to recognize limitations in the research evidence.* These limitations may be of many types such as non-representativeness in sampling, biases in the data, inadequacies in the research design, defective data-gathering instruments and inaccurate statistical analysis.

4. *Misinterpretation due to unstudied factors.* A given result is composed of many factors, it is not produced simply by a single factor. The factors which condition any result are innumerable ; usually we assume that those we have not studied will average out and will be the same for one group as for the other. This is an assumption which is convenient, but not always safe.

In some instances the interpretation is difficult or inconsistent with other results because one has conceived of his problem in too narrow sense.

One's conclusions are always limited to the factors studied, and the cautious person will not draw generalizations which involve factors and conditions which he has only assumed.

5. *Ignoring selective factors.* In investigations where a selective group is made the subject of study (*e.g.* institutional delinquents) or where a selective factor is operating on the situations studied (yearwise failures in a four-year course) one is likely to reach unwarranted conclusions if one ignores the selective factors. To find that all the institutionalised delinquent children have a low level of intelligence to conclude, therefore, that all delinquents have a low intelligence level is ignoring the fact that there exist outside the institution, many delinquent children with normal or above-normal intelligence.

6. *Difficulties of Interpretative Evaluation.* In studies of the descriptive nature—historical or normative survey—proper interpretation of data rests on proper evaluation of facts. If fifty per cent of the teachers studied express that the curriculum prescribed for the Matriculation Examination is satisfactory while fifty percent say that it is unsatisfactory, what is the investigator to understand by his data ? The investigator is not in a position to judge which of the two groups is right unless he has studied and evaluated the curriculum himself and assumed that his judgement on the point is correct.

Explanation of one's research findings in terms of their practical implications, which often forms a usual part of the research undertaken, is fraught with the danger of misrepresentation. Factual interpretation and personal interpretation of their implications should never be confused. They should be kept apart in a research report.

COMPARISON IN INTERPRETATION

The element of comparison is fundamental to all research interpretations. Comparison of one's investigational findings with a criterion, with results of other comparable investigations, with normal or ideal conditions, with the judgement of a panel of judges or opinions of educational experts forms an important aspect of interpretative efforts of a researcher.

CONCLUSIONS AND GENERALIZATIONS

The chief purposes for which research is conducted are : (1) to determine the status of phenomena, past and present ; (2) to ascertain the nature, composition, and processes that characterize phenomena ; (3) to trace growth, change and developmental history ; and (4) to study cause-and-effect relationships.

In the search for truth the investigator starts with some felt need or difficulty, and employing such knowledge of the situation as he may already possess or secure from a direct preliminary examination of the object or from previously reported experiences, he formulates some tentative conclusions, hypotheses, or suppositions as to the probable nature of the phenomenon under investigation. These hypotheses may be employed in the further examination of the data that are already available. Using these data, each hypothesis is carefully tested in both thought and fact and accepted, modified, or rejected as the available evidence indicates. If the evidence already available is sufficient to establish the hypothesis or hypotheses, the investigation may be concluded at this point, but if insufficient, a new appeal to experience must be made.

Careful formulation of generalisation. In an earlier chapter, the characteristics of a good hypothesis were enumerated as follows : (1) a good hypothesis is conceivable and in agreement with the observed facts ; (2) a good hypothesis does not conflict with any law of nature which is known to be true ; (3) a good hypothesis is stated in the simplest possible terms, and (4) a good hypothesis admits of the application of deductive reasoning. These same characteristics are applicable to the conclusions drawn from educational investigations and should be so employed in evaluating the generalizations reached.

As the research worker comes to the conclusion of his investigation, he should review carefully the evidence for and against each hypothesis. Each generalization must agree with the facts revealed by the investigation. The investigator will desire to check each generalization carefully, not only against the facts of his own study but against the facts and experiences of other investigators. As one turns to facts for the verification of hypotheses, one must return not only to the facts of one's own investigation but again to the facts of previous studies.

There are four common instances in which the conclusions of investigations do not accord with the known facts. In the first case the investigator gives conclusions which are directly contrary to the facts. This situation arises occasionally where there are strongly preconceived ideas of the results. Then there is the case in which the investigator assumes that the names given to data-gathering devices accurately indicate what they measure. Many of the generalizations relative to the relationship between intelligence and scholastic success, for example, are subject to this error, in as much as most of the so-called intelligence tests do not really measure intelligence. A third type of situation, in which generalizations may not be in accordance with the data, is that in which the facts and relationships found to exist under certain conditions are held to be true under all conditions. Many illustrations of this fallacy may be found in the field of learning, where certain facts are discovered about the learning of certain materials like nonsense syllables by pupils of certain ages, interests and levels of intelligence under certain conditions, and these facts are held to be true for all materials, learned by all pupils under all conditions. Finally, the generalizations made in evaluative investigations are not always in accord with the facts, because of the partial measurement of outcomes. If one were investigating, for example, the relative merits of direct and activity learning, and measured only certain outcomes, it would be erroneous to say that the facts show either the direct or indirect method of learning superior to the other, since only part of the outcomes were studied, with only a limited number of pupils studying certain materials under given conditions. Experienced research workers limit conclusions to bring them into close agreement with the known facts.

A second test of the dependability of the conclusions drawn from any particular investigation is their agreement with previously established generalizations. If a conclusion is in conflict with a generalization already held to be true, the disagreement must be resolved, either by showing that the conflict is not real or that the conflicting statement is false.

Attention has already been directed to the fact that the number of hypotheses should not be needlessly multiplied. Every generalization should be reduced to the simplest possible terms consistent with clarity of expression. The terminology must be simple and direct but of such a character as to summarize as precisely as possible the actual facts of the case. Each generalization should be studied with extreme care, in terms of accuracy, clarity, and simplicity of expression.

Remembering that the generalizations of one study may become the point of departure in a subsequent investigation, they should be formulated in terms which render them subject to further verification. It is futile to employ mystical forces to explain educational phenomena. If the projected cause of a phenomenon cannot be verified in fact, however true it may appear, it must be discarded in all scientific explanations. That every generalization be verifiable is a fundamental principle of scientific method which the investigator should consider carefully before casting a conclusion in final form.

Some Common Fallacies of Reasoning. There are some common fallacies of reasoning leading to erroneous generalizations. These fallacies can be enlisted as under :

1. Argument from a single or limited number of instances.
2. Argument from positive instances to the neglect of negative cases.
3. The omission of evidence contrary to one's opinion.
4. Failure to observe important circumstances attending different phenomena.
5. Erroneous conclusions due to prepossessions, pre-conceived ideas and prejudices.
6. Attributing to a single variable, effects resulting from two or more variables.
7. Inaccurate instruments of measurement ; dependence upon subjective judgement, estimates and guesses.
8. Argument from analogy.
9. Failure to discriminate between material and immaterial circumstances.
10. Mistaken inferences of various sorts, and
11. Generalizations from insufficient data.

Fowler further lists the following fallacies :

1. fallacy of non-observation, consisting of neglect either of some of the instances or some of the circumstances attendant on a given instance,
2. fallacy of mal-observation,
3. errors incidental to classification, nomenclature and terminology,
4. errors commonly arising out of the use of the inductive methods : mistaking *a* for the cause of *b* when the real cause is *c*; mistaking *a* for the sole cause when *a* and *c* are the joint causes ; mistaking the remote cause for the proximate cause or the reverse ; inversion of cause and effect, and
5. false analogy including argument from final causes. As the research worker comes to the end of his investigation it is highly desirable that he take careful inventory of the data, processes, and conclusions of the study as a whole.

Much has already been said in the literature of education about the dangers involved in generalisations arising from the study of too few cases.

Aside from the above list of fallacies, the investigator should not lose sight of the fact that what one sees in the study of educational problems depends upon what he knows, and that one's conclusions are accurate and fruitful, exactly in proportion to the thoroughness and correctness of one's previous knowledge. When previous knowledge is vague and indeterminate, the observation will lack definiteness and depth, and will ordinarily lead to unfruitful results.

There are two well-recognized levels of generalisation attained in educational research : (1) empirical generalizations, and (2) complete scientific explanation. When one observes some uniformity of nature which he holds to be true and for which he has no adequate explanation, his knowledge is said to be empirical. If one knew, for example, nothing of the theory of gravitation and planetary motion, but had observed the sun to rise in the east each morning, his knowledge of the movement of the sun would be empirical. Most of the practices in the field of education today rest not upon complete scientific explanation but upon observed uniformities arising from either ordinary observation or scientific investigation for which there are as yet no satisfactory explanations. The distinguishing feature of empirical knowledge however, is not whether it has its origin in ordinary observation or in scientific investigation, but whether it is explained and understood. It arises not only in agriculture, medicine or education but also in the physical and biological sciences and wherever there are observed but unexplained uniformities.

The aim of every science is to extend knowledge beyond the facts of observation to other facts that have not been observed, by binding them together into one comprehensive system of knowledge. One desires to know not merely that the sun rises regularly in the east, but why it rises in the east and why it is likely to do so for some time to come. It is not merely that certain phenomena behave in certain observed uniform ways, but why they behave as they do is also to be known. To make such explanations one must refer the observed uniformities to some already established principle of science. One understands a thing only when he grasps its underlying principles.

Hints in formulating generalizations

1. Before drawing up conclusions and generalizations, it is advisable to summarize the findings of the study and compare them with the hypotheses formulated in the beginning.

2. The conclusions should be based on the evidence of sound, adequate data. All questionable or incomplete data and untested assumptions should be avoided.

3. The conclusions and generalizatious must answer the questions asked in the statement of the problem.

4. They must prove or disprove the hypothesis or hypotheses framed in the beginning.

5. They must recognize the limitations due to faulty or incomplete data.

6. They may be accompanied by suggestions for application and implementation and suggestion of problems for further investigation.

TWENTY TWO

The Research Report

There is every need for clear, forceful expression in reporting the results of an educational investigation. In many instances, worthwhile results secured from an experiment or study have been rendered comparatively ineffective through a careless and inadequate style of writing and organization. Undoubtedly there is a close relation between clear thinking and a well-organized, effective style of writing. The most fundamental element in determining the value of a research report is the scientific character of the material presented.

Monroe and Engelhart have stated—"The report of an investigation not only serves to record and communicate the procedure and the results but it also fulfils an important function in the process of research. In the act of writing, if it is well done, the research worker refines his thinking, and the detailed record facilitates the critical testing of the work done. If he is interested in communicating his work to others, the report must be well written in order to fulfill that purpose effectively.

Although research reports may differ considerably in scope of treatment they are expected to follow a similar pattern of style and form that have been conventional in academic circles. The metters of style and form are based upon principles of clarity of organization and presentation and it is essential that the researcher be familiar with them, if he is to communicate his ideas effectively.

Some research departments or institutions have designated an official manual, or have established their own style manual, to which their theses or dissertations must conform. The researcher should find out which manual has been adopted officially by his institution or department.

Format of the Research Report

A research report usually follows a fairly standardized pattern. The following outline presents the usual sequence of various sections.

A. Preliminary Section or Front Matter.

1. Title Page

2. Approval Sheet
3. Acknowledgements (if any)
4. Preface or Foreword
5. Table of Contents
6. List of Tables (if any)
7. List of Figures (if any)

B. Main body of the Report

1. Introduction
   (*a*) Statement of the Problem
   (*b*) Significance of the Problem
   (*c*) Purposes of the Study
   (*d*) Assumptions and Delimitations
   (*e*) Definition of Important terms
   (*f*) Statement of Hypotheses
   (*g*) Assumptions Underlying the Hypotheses
2. Review of Related Literature or Analysis of Previous Research.
3. Design of the Study
   (*a*) Procedures used
   (*b*) Methods of gethering data.
   (*c*) Description of data gathering instruments.
4. Presentation and Analysis of Data.
   (*a*) Text
   (*b*) Tables
   (*c*) Figures
5. Summary and Conclusions
   (*a*) Brief Restatement of Problem and Procedures
   (*b*) Description of procedures used
   (*c*) Principal Findings and Conclusions
   (*d*) Recommendations for further research.

C. Reference Section.

(*a*) Bibliography
(*b*) Appendix
(*c*) Index, if any.

The first step towards preparing a report should be the preparation of an outline of its major divisions and then subdivisions in the form of headings and subheadings of proposed chapters, sections or even paragraphs. This outline would guide the researcher in arranging the material at his disposal in an orderly manner as it sets down the design of the report.

PRELIMINARY SECTION

The Title Page. Several pages of preliminary material precede the body of a report in a dissertation. The first page of the report is the title page. Although title page forms differ from one institution to another, they usually include, (1) the name of the topic or the title of the study, (2) full name of the candidate and his previous academic background, (3) name of the faculty and institution to which the report is submitted, (4) degree for which the report is presented, (5) the date of presentation. These items are centered between the margins of the page and no terminal punctuation is used. The title is presented in capital letters, but only the initial letters of principal words are capitalized in other items. If the title extends beyond one line, it is double-spaced and placed in an inverted pyramid style.

The title should be concise and should indicate clearly the purposes of the study. It should not claim more for the study than it actually delivers. Its key words should make it easy for the bibliographers to index the study in the proper category.

Approval Sheet. If the institution requires an approval sheet, a page of the dissertation allots space for the necessary certificate and the signatures of the supervisor or the members of the dissertation committee.

Acknowledgements. The acknowledgement page is largely a matter of courtesy. The investigator acknowledges the guidance and assistance he has received in carrying out the study. It conveys indebtedness for the professional, academic and administrative assistance received by him. Good taste calls for acknowledgements to be expressed in a simple and restrained language. Flattery and effusive recognition for routine participation by members of the writer's family, faculty advisors, librarians and clerical helpers are considered unnecessary and in poor taste.

Preface or Foreword. Sometimes a preface or foreword, one or two pages long, follows the acknowledgement page, containing some initial remarks and perhaps a brief statement of the scope, aim and general character of the research.

Table of Contents. It occupies a separate page or pages, gives the readers a bird's eye-view of the report and enables them to locate quickly each section of it. It includes in it the chapter headings, the major subdivisions of the chapters and sometimes the topics within the subdivisions. The chapter titles are usually typed in capital letters and the subdivision headings in small letters with the initial letter of the principal words capitalized. All titles and headings appear in the exact words and order as they do in the report, and each is followed by the correct page citation.

List of Tables and Figures. If tables and figures form a part of the report, their lists are given on separate pages. The full titles of figures and tables, worded exactly as they appear in the text, are presented with corresponding numbers and page locations.

All pages in the preliminary section are numbered at the centre of the bottom margin with lower-case Roman numerals (*i*, *ii*, *iii*, *iv*).

MAIN BODY OF THE REPORT

The kernel of the study, the data and their analyses, follows the preliminary materials. The body of the report contains a number of divisions.

I. **Introduction.** It serves as an orientation to the investigation. In the introduction you state and analyse the nature of the problem and develop a foundation for your investigation. It usually includes a statement of the factors leading upto the choice of the problem, the purposes of the study, the value and significance attached to the problem by the investigator as a contribution to education and any information to express the sincerity of the investigator in his selection.

Statement of the Problem. A statement and elucidation of the problem sometimes forms a part of the introduction, but more often it is set up as a separate chapter. If the problem is stated in a clear-cut and logical manner, the reader is able to get a sufficiently clear insight into the study from the very beginning It has been stressed in an earlier chapter that the problem should be finalised and stated after a sufficient study, reflective thinking, consultation, discussion and guidance.

Significance of the Problem. The background of the problem under study is thoroughly provided in the first pages of the chapter of introduction. After stating the problem, justification of its study is developed by giving its significance and importance.

Purposes of the Study. The importance of the investigation will be further highlighted by enlisting purposes and objectives of the study.

Assumptions and Delimitations. Any technical assumptions behind the investigation will also be clearly stated. The exact area the investigation is supposed to cover must be well demarcated. The sources of information selected and their nature and delimitations should be mentioned and justified.

Definition of Important Terms. You then define the terms that are essential to the study or are used in a restricted or unusual manner so the reader may understand the concepts employed. It gives the reader a clear concept of the scope of the study and the precise explanation offered for the problem.

Statement of Hypotheses. Then the investigator gives the hypotheses he has formulated for the purpose of collecting further evidence for the verification of the same.

Assumptions underlying the Hypotheses, The hypothesis/hypotheses are formulated only after some experience and evidence. Any assumptions underlying the same or restrictions placed on the same are also stated in order to build essential justification of the same.

2. Review of Related Literature. The section reviews the important literature related to the study. Previous research studies are abstracted, and significant writings of authorities in the area under study are reviewed. This part of the report provides a background for the development of the present study and brings the reader up to date. Since further research is based upon everything that is known about a problem this section gives evidence of the investigator's knowledge of the field. A brief summary, indicating areas of agreement or disagreement in findings, or gaps in existing knowledge, should be included. The author finds an opportunity to justify his own endeavour and to emphasize new, worthwhile elements of his study. This resume is not a summary of everything you have read nor a chronological list of the most pertinent abstracts that the reader must dissect to discover how they relate to the present problem. Rather the resume is a well integrated discussion of the previous relevant studies and theories which points up the issues involved in the present investigation. In a logically structured discussion, you bring together the results of the existing research, show how the studies are related, point out areas of agreement and disagreement, and indicate where gaps or weaknesses exist that have given rise to the present study. The significance of the problem, the need for conducting the investigation. and the logical rationale that justifies your hypothesis become evident when the problem is placed in this wider framework of knowledge.

3. Design of the Study. The third section explains the design of the study in detail. The size and selection of the sample, the variables and the controls employed, the sources of data, the tools, and methods of gathering data, the reliability of instruments selected or constructed and the statistical procedures used in the analysis are carefully described.

Procedures Used. This sub-section describes the method of attack employed in the investigation. It gives an accurate, detailed description of how the work was done. Your objective is to provide an explanation that will enable the reader to repeat the investigation—reproducing the exact conditions of the original study—to check its findings. You may present (1) a definition of the population and an explanation of why the population is relevant for the study ; (2) the rationale of the size of the sample, (3) how the sample was selected, (4) data that describe characteristics of the subjects that are relevant to the problem (5) the number of subjects who declined to participate, dropped out, or did not participate in all parts of the study and why ; (6) where, when and what type of data were collected and by what instruments ; (7) the number of times and order in which the instruments were used and the time allotted to each data-collection session ; (8) the rationale for selecting the design—the assumptions made, experimental controls established, how subjects and treatments were assigned to groups, and how variables were manipulated ; (9) the verbal or written directions, and the briefings and debriefings given the subjects ; (10) the characteristics of interviewers or observers and how they were trained ; (11) the types of data analyses made, the reasons for choosing the particular statistical procedures employed and the level of significance selected ; (12) how the data will be presented ; (13) an account of the pilot study ; (14) an explanation of any methods that were employed and abandoned because they proved to be inadequate or valueless and (15) suggestions for improving the procedures in further studies.

Methods of data gethering. There are various methods and techniques of data gathering. The methods and techniques preferred by the investigator for his study have to be justified and described in detail. These methods and techniques have to be determined in the light of the nature of the problem and the sources of relevant data.

Description of data gethering instruments. Well-known data-gethering instruments and readily available apparatus are described briefly and references are listed to reveal where more detailed discussions may be found. But if new apparatus or instruments or variations of old ones are employed, detailed descriptions and drawings of them and clear explanation of how they were used are given. After describing the investigative instruments you explain the procedures employed to calibrate those that require it. For any nonstandardized instrument, you obtain independent validity and reliability estimates and, when applicable report whether they are lower than the estimates in the original study. For standardized instruments, you indicate why the original reliability and validity data obtained during the standardization process apply in this study, or, if you use a sample that differs from the samples used in the standardization process, you obtain independent estimates. Before presenting the results of your findings, you check to make certain that no essential information has been omitted, that the reader must possess to follow or to comprehend the rest of the report or to replicate the study.

4. **Presentation and Analysis of Data**. The data analysis and interpretation may be presented in separate chapters or may be integrated and presented in one or more chapters. This is the heart of the research report. Sometimes, separate chapters are devoted to the tabulation, analysis and the interpretation of data. The arrangement depends on the quantity of information one has to convey to the reader regarding the different stages in the process of the development of the study. Analysis and interpretation of data have to be done through the media of text, tables and figures, which are discussed below separately :

Text. Because of the wide variety of studies and kinds of data that exist, no specific directions can be given for organizing this section of the report, but the descriptive and inferential aspects of the data are analyzed for each problem hypothesis, null hypothesis, or subproblem in turn. Data relevant to each hypothesis must be categorized, manipulated and summarized in ways that reveal the pertinent information required to confirm or disconfirm the hypothesis. In most studies, the raw evidence is subjected to specific statistical treatments and the values that are obtained, rather than the raw data, are reported in the study. The statistical treatment to which the data were subjected is clearly specified. For each statistical method used, you present evidence indicating that the assumptions underlying its use have been met.

Extracting the meaning from the data is one of the most difficult and delightful phases of an investigation. In the textual discussion of the data, you do not repeat all the detailed information but rather point out important facts and relationships, make certain generalizations about the data, refrain from making any generalization that is not solidly supported by the data, and interpret that data. After drafting an explanation, you examine the data for exceptions, try to account for them, and restate your explanation if necessary. If more than one explanation can be given for a particular aspect of your data, you discuss honestly and thoroughly all explanations—not merely the one you favour, but you are free to marshal all the evidence you can to indicate why you have rejected rival explanations. Your decisions, of course, might be disputed by another investigator. When stating the results of the study, careful qualifications are included that stipulate the precise conditions, situations or limits for which the findings are valid, such as the nature of the population to which the conclusions apply.

In reporting and interpreting the data, you note whether the relationship exists between the independent and dependent variables that must exist to confirm your hypothesis, point out that certain other variables that might have affected the dependent variable were controlled and call attention to uncontrolled variables that may have affected the results and discuss their possible implications.

In interpreting the data, you once again scrutinize the adequacy and appropriateness of the research design, methods of observation and measurement and types of analysis for the research problem.

Your main objective in an investigation is to note whether hypothesized relationships are confirmed, but if you note any unpredicted relationships, you report these findings and suggest that they should be substantiated in specifically predicted and tested independent studies. In interpreting the data you point out how consistent or inconsistent your findings are with those of related studies and with the demands and expectations of the theory you have reviewed in the introduction of your report. In this manner, you tie your study into the network of existing scientific information and make your contribution to the advancement of knowledge.

Tables and figures. Apart from textual discussion, the data are critically analyzed and reported through tabular and graphic devices. Good tables and figures are constructed and titled so that they are self-explanatory. They are relatively simple, pointing up one or two significant relationships. If complex tables are developed, they should be placed in the appendix.

5. Summary and Conclusions

This is the fifth section of the main body of the report. The summary is probably the most difficult section of the report to write.

Beginning researchers are sometimes guilty of overgeneralizing on the basis of their limited data. Previously held convictions, not tested by the analysis, creep into the discussion. The course instructor often has to comment, "Your study to this point has been good. Your summary is disappointing. What you have reported may possibly be true, but there is nothing in your study to justify or support your conclusions."

In the summary, you briefly review the procedures, findings, and entire development of the study. The important points in the study are brought together in the summary, but not all the evidence upon which they are based is repeated. The conclusions are stated precisely and related directly to the hypotheses that were tested. The conclusions announce whether the findings of the study confirmed or disconfirmed the hypotheses. If the conclusions modify an existing theory, this fact is discussed. If the data have any implications for educational programmes or practices, these may also be discussed.

The summary and conclusion chapter is the most widely read part of a study because it recapitulates the information that has been presented in the previous sections of the report. Most readers scan the summary first to obtain an overview of the problem and to determine the usefulness of the study to them. If the study is pertinent to their purposes, they examine the remaining chapters.

In addition to the summary, some institutions require a candidate to submit an abstract of 600 words or less to fulfill requirements for a degree. An abstract serves not as a substitute for the summary and conclusion chapter but rather as a synopsis, enabling a scholar to judge whether he should read the complete work.

Brief Restatement of Problem and Procedures. After a brief statement of the problem and a description of the procedures used in the investigation, the findings and conclusions are presented.

Description of Procedures Used. The procedures used, the design of the study, methods of research employed, the techniques and tools used for data collection, treatment of data, the methods of analysis and interpretation of data and all other steps are described briefly in order to enlighten any reader in this respect.

Principal Findings and Conclusions. The final unit of the report usually contains the findings of the study, the conclusions the investigator has arrived at and the generalization he has formulated. In stating the conclusions, the investigator must indicate what his contribution has been to his field of study. Negative as well as positive results should find a place in the conclusions.

Recommendations for further research. It may be appropriate in concluding this part of the report to indicate promising side-problems that have been uncovered and to suggest areas or problems for further investigation.

Reference Section. The bibliography, appendix and index which will be discussed in detail later in this chapter, follow the main body of the report.

Bibliography. The bibliography is preceded by a sheet containing the word BIBLIOGRAPHY, capitalized and centered on the page. The first page of the bibliography has the centre BIBLIOGRAPHY. The method of referencing a particular type of source should be consistent down to last comma.

Appendix. An appendix, if included, follows the bibliography. You do not merely dump left over products of the study in the appendix, rather you present relevant supporting materials that are too unwieldy to be placed in the body of the dissertation.

Index. If a study is complex, of major importance, or to be published in book or monograph form, you also prepare an alphabetized index, which follows the appendix.

STYLE OF WRITING

The research report should be presented in a style that is creative, clear and concise. Although the phraseology should be dignified and straightforward, it need not be dull or pedantic. Even the most profound ideas can best be explained in simple language and short, coherent sentences. Slang, or hackneyed phrases and folksy style should be avoided. Since objectivity is the primary goal, there should be no element of exhortation or persuasion. The research report should describe and explain rather than try to convince.

In the interest of objectivity, the personal pronouns, I, we, you, my, own and us should not be used. These personal pronouns can be avoided by the use of such expressions as the investigator or the researcher.

Only the last names of cited authorities are used. Titles such as Professor, Dr., Mr. and Dean are omitted. The past tense should be used in describing research procedures that have been completed.

Abbreviations may be used in footnotes, tables and figures but they should not be used in the text of the report.

When employing qualitative terms, numbers beginning a sentence should always be spelled out. Fractions, round numbers and numbers under 100 should be spelled out, except when they are combined. Use one-half, but 4½or 4·5. Percent is spelled out except in tables and figures. Use Arabic numerals with percent, unless they begin a sentence. In numbers with more than three digits, commas should point off thousands or millions.

Ordinarily, standard statistical formulae are not presented in the research report, nor are computations included. If a rather unusual formula is used in the analysis it is appropriate to include it.

The ordinary rules of correct usage should prevail. Research workers who have difficulty in written expression should have a competent friend proofread their copy for correct usage before they type the final manuscript. Inability to write correctly is a serious limitation. Carelessness is an even greater fault.

Effective research report writing is not an easy task. Good reports are not written hurriedly. Even skillful and experienced writers revise many times before they submit a manuscript for publication. To avoid making unnecessary, time-consuming revisions of your report, you should study the report format and style manual recommended by your guide. Several style manuals are available to choose from if you are specifically granted the right to select your own. After adopting a style manual, you must adhere to it throughout the report.

Organisation. Mastering the methods of reporting is important, for an outstanding scientific investigation is of little value if the findings are not communicated effectively to others. An analysis of the style employed in educational periodicals ends with the recommendation that educational writing be done in a straightforward, business-like manner suited to technical publications. Obviously, school workers and writers in education should seek to employ a vocabulary as exact and uniform as that used by practitioners in medicine or law. A number of specific factual studies of the range of terminology employed in education are available. Of course, space is not available to present a glossary of educational terms, which seems unnecessary in view of the several dictionaries devoted to this purpose.

Spewing a disordered jumble of raw facts into a report not only fails to convey information to the reader but also suggests thot you have not grasped the significance of your materials. Only through arduous intellectual effort can you organize facts so that they deliver the precise ideas you have in mind.

Proportion and Emphasis. To achieve proper proportion and emphasis in a report, you keep revising your outline until you have placed all topics of equal importance on the same level. You refrain from stating main ideas in a few sentences and elaborating upon minor points. When revising a report, you delete words and sentences that give too much weight to minor topics and add supporting evidence and illustrations to expand underdeveloped major topics. It is done by placing topic sentences where they quickly capture the reader's attention, put key words or phrases at the beginning or end of sentences and utilize numbers or italics to signal that statements are important.

Unity and Clarity. To create unity and clarity in your report, you select homogeneous items from your notes, state the ideas in coherent sentences, place these sentences in a logical sequence, and weave them into paragraphs that in turn are logically related. To ensure the flow of the manuscript, you examine paragraphs and chapters to determine whether like ideas have been placed together and whether one idea leads naturally to the next.

Other Style Problems. It is also essential to follow the rules and conventions in the use of abbreviations, capital letters and quotation marks. The use of abbreviations should be avoided in the text of the report. Even in the footnotes, the bibliography and the tables, only a few abbreviations are not considered appropriate.

The rules for correct capitalization should be followed meticulously. Capitals should not be used in words just for emphasis but only when they add to clarity and are warranted by the rules of rhetoric. In general, the modern practice is to economize on capitals.

The proper use of quotations needs consideration. Direct quotations are often used by report-writers to support their own arguments, to lend prestige of outside authority and colour of a variety of expression. But using such quotations in excess, may be considered a limitation.

TABLES

Tables are a popular illustrative device for presenting the data in a more effective manner than a mere verbal presentation. Maps, charts, diagrams, graphs and tables are useful illustrative devices, but should be used judiciously.

Tables that are accurately compiled, properly arranged, easily read and correctly interpreted may convey information more effectively than many paragraphs of written description. Through the use of a table, you may help readers spot important details, see relationships, get a concise overview of the findings, or grasp the significance of data much more quickly and easily than through many pages of prose explanation.

A table is a systematic method of presenting statistical data in vertical columns and horizontal rows, according to some classification of subject matter. Good tables are relatively simple, concentrating on a limited number of ideas. It is often advisable to use several tables rather than to include too many details in a single one.

If a table is large enough to occupy more than a half-page, it should be placed on a page by itself, carefully centred for a balanced effect. If it is short, occupying less than a half-page, it may be placed on the page with textual material, preferably following as closely as possible the textual discussion that relates to it. Tables should not exceed the page size of the manuscript. Large tables should be reduced to manuscript page size by photostating or some other process of reproduction. Tables that are too wide for the page may be turned sidewise.

The word TABLE is centered between the page margins and typed in capital letters, followed by the table number in capital Roman numerals. Tables are numbered consecutively throughout the entire report or thesis, including those tables that may be placed in the appendix. The caption or title is placed two spaces below the word TABLE, and arranged in inverted pyramid form. No terminal punctuation is used. The main title should be brief, clearly indicating the nature of the data presented.

The top of the table is placed three spaces below the last line of the title. Column headings, or box heads, should be clearly labeled, describing the nature and units of measure of the data listed. Such terms as number, percent and frequency may be abbreviated by the use of No. % and *f*. If numbers are shortened by the omission of zeroes, that fact should be mentioned in the subtitle. The stub, or label, for the rows should be clear and concise, parallel in grammatical structure, and if possible, no longer than two lines.

Numerical data are usually arranged in descending order of magnitude or frequency, so that comparisons by position can be noted readily. If there are several columns in the table, the first column to the left is arranged in descending order. Lines of tabular data are single-spaced. Rulings or lines are used only if they facilitate the reading of the table. Few horizontal lines are needed. Vertical lines at left and right margins are omitted.

Decimal points should always be aligned in the column. When no data are available for a particular cell, indicate the lack by a dash, rather than by a zero. Double horizontal lines are placed at the top of the table separating it from the title. A horizontal line is also placed at the bottom to separate the table from the material which follows, three spaces below.

When footnotes are needed to explain items in the table, small Arabic letters are used. Table footnotes are placed just below the table, rather than at the bottom of the page.

FIGURES

A figure is a device that presents statistical data in graphic form. The term figure is applied to a wide variety of graphs, charts, maps, sketches, diagrams and drawings. When skillfully used, figures present aspects of data in a visualized form that may be clearly and easily understood. Some ideas may be communicated more effectively by figures than by written or tabular presentations. Figures should not be intended as substitutes for textual description, but included to emphasize certain significant relationships.

Characteristics of good figures. Many of the qualities of good figures are enlisted below :

1. The title should clearly describe the nature of the data presented.

2. Figures should be simple enough to convey a clear idea, and should be understandable without the aid of textual description.

3. Numerical data upon which the figure is based should be presented in an accompanying table, if they are not included in the figure itself.

4. The figures should not suffer from oversimplification, misrepresentation or distortion.

5. Figures should be used sparingly.

6. Figures that occupy more than a half-page should be placed on a separate page.

7. Figures should follow, not precede, the related textual discussion.

8. Figures are referred to by number, never as "the figure above" or "the figure below."

9. Figures are numbered with Arabic rather than Roman numerals.

10. The title of the figure is placed below rather than above it.

Types of figures. The commonest forms of figures used in reports are line graphs, bar graphs, pie charts, area or volume charts, pictorial charts, maps, diagrams of apparatus, and photographs. Some of them are being described below :

The line graph. The line graph is useful in showing change in data relationships over a period of time. The horizontal axis usually measures the independent variable, the vertical axis the measured characteristic. The figure formed by the lines connecting the point is known as a frequency polygon.

The bar graph. The bar graph may be arranged either horizontally or vertically. It represents data by bars of equal width, drawn to scale length. The numerical data may be lettered within the bar or outside it. In bar graphs the bars are usually separated by space. Horizontal bar graphs are usually used to compare components at a particular time. Vertical bars are used when making comparisons at different times.

The circle or pie chart. This type of chart shows the division of a unit into its component parts. It is frequently used to explain how a unit of government distributes its share of the revenue, how an individual spends his salary, or any other type of simple percentage distribution. The radius is drawn vertically, and components are arranged in a clockwise direction in descending order of magnitude. The proportion of data is indicated by the number of degrees in each segment of the 360° circle.

Maps. When geographic location or identification is important, maps may be used. Identification may be made by the use of dots, circles or other symbols and density or characteristics of areas represented by shading or crosshatching.

QUOTATIONS

Laymen often joke about a too large number of quotations and footnotes found in research reports. Pasting too many quotations into an authority-laden text does not create an acceptable research report. Strings of these passages reveal that you are little beyond the note-taking stage of your work. A research report is a creative effort—a synthesis of what you have read, observed, thought, and mentally ordered into new patterns—rather than a mere compilation of other people's work. You may use quotations, but use them sparingly and purposively.

Art of quoting. If you paraphrase rather than quote materials, your discussion moves more directly and forcefully towards your objective. When you cannot rephrase a law, formula, or idea as concisely, accurately or effectively as the original author has phrased it, you use a direct quotation. Whenever possible, you select a short quotation and plant it in your own sentence. To avoid introducing quotations repeatedly with "Mr. Singh says", you place the introductory phrase within or at the end of the quotation.

Mechanics of quoting. The rules for presenting short and long direct quotations differ. A short quotation is enclosed in quotation marks, double-spaced, and incorporated in the paragraph. A quotation that appears within a short quotation is enclosed in single quotation marks. The arabic reference numeral to the footnote is typed half a space above and after the phrase or sentence quoted, and after the punctuation mark if it comes at the end of the sentence. Long quotations —four or more type—written lines—are usually set off in separate single-spaced paragraphs that are indented in their entirety, and no quotation marks are necessary. Quotations within long quotations are set off by full quotation marks. Exceptionally long quotations may be placed in the appendix. A quotation that occurs in a footnote is single-spaced, enclosed in quotation marks, and indented in paragraph style.

There is need to check for accuracy when duplicating quoted material.

Some other items of mechanics are like this. If the first word of a quotation is grammatically linked to what precedes it in the sentence, the word is not capitalized even though it was capitalized in the original sentence. Only one punctuation mark accompanies the terminal quotation marks :

(1) a period or comma is placed inside closing quotation marks,

(2) a colon or semicolon is placed outside quotation marks,

(3) an interrogration or exclamation point is placed inside if it belongs to the quoted matter and outside if it is a part of the whole sentence.

FOOTNOTES

Footnotes serve various purposes :

(1) Some give source references for direct quotations or paraphrased material,

(2) some provide cross references to materials appearing in other parts of the report,

(3) some indicate sources that contain substantiating evidence, and

(4) some explain or elaborate upon a point in the textual discussion. The last type should be kept to a minimum. Many editors

insist that if something is important enough to be said, it should be placed in the report.

Footnotes enable writers to substantiate their presentation by citations of other authorities, to give credit to sources of material that they have quoted or paraphrased and to provide the reader with specific sources that he may use to verify the authenticity and accuracy of material used. Occasionally that are also used to present explanatory statements that, although important, would interfere with the logic and continuity of textual material. In serving their various purposes, footnotes are very useful devices. They should be used sparingly, however and never included for the mere purpose of scholarly appearance.

Citation of footnotes. Several methods of inserting footnotes have been devised. The traditional procedure is to place at the bottom of the page all footnotes for citiations appearing on that page. The footnotes are separated from the text by a short line—twenty spaces—drawn from the left margin one space below the written discussion. Beneath this line a double space is left before the first note is typed, the footnotes are single-spaced with double spaces between them. Each footnote is indented as in a paragraph and preceded by a superscript numeral that corresponds to the reference numeral used in the textual material. The first word of the footnote follows the reference superscipt numeral ; no punctuation or space is necessary. If the textual material consists of tables, mathematical materials or formulas; an asterick or some other non-numerical symbol is selected to identify a footnote. The writer either numbers footnotes consecutively throughout the report or begins anew on each page or in each chapter, depending upon the institutional requirements.

If a report is to be published, authors may employ other methods of inserting footnotes to facilitate the work of the typesetter. They may place the footnote immediately following the textual reference on the page and separate this source information from the rest of the paragraph by typing unbroken lines above and below it. To conserve space and to cut printing costs, some publishers prefer to have a coded reference to a source placed immediately after and in alignment with a direct quotation. A bibliographical code like (12 : 24—25) may be employed. Many research journals use an author and date of publication i.e. Smith, (1978). If an investigator uses the author – date method, he can omit or add references to a bibliography at any time without remembering all the entries and making the necessary changes throughout the text. This method of citation is especially applicable for materials appear in research journals where no quoted materials appear.

In another procedure all the citations are placed on one page at the end of the chapter. Each institution or department usually specifies the type of footnote citation permitted or recommended.

Abbreviations in footnotes. To save time and space, full bibliographical information is presented in the footnotes the first time that a reference is made to a source ; thereafter, abbreviations are used to identify it. In consecutive footnote reference the abbreviation **Ibid** (Latin, *the same*) may be used. If the page reference is different, the new page citation follows :

[5]Fred N. Kerlinger, **Foundations of Behavioral Research** (New York : Holt, Rinehart and Winston, 1973) p. 217.

[6]Ibid (indicates same page as previous reference)

[7]Ibid, p. 230 (same work, but a different page).

When references to the same work occur within a page or two, **op. cit.** (Latin, *the work cited*) may be used, always with surname of the author reference. Op. cit. is used when another reference intervenes.

[4]Clinton I. Chase, **Elementary Statistical Procedures** (New York Mc Graw—Hill Book Co., 1967), 15.

[6]Chase **op. cit.** 30.

[7]Philip H. DuBois, **An Introduction to Psychological Statistics** (New York : Harper and Row, 1965), 20.

When a second but nonconsecutive reference follows, referring to the same work and same page previously cited, **loc. cit.** may be used. Again the author's surname must be included.

Du Bois, **loc. cit.** (This reference is to page 20).

In addition to the symbols above, the student should be aware of following standard abbreviations :

anon	anonymous
c (circa)	about (approximate date)
cf.	compare
ch., chap.	chapter
col., cols.	column (s)
ed., eds.	edition (s)
et. al.	and others
et seq.	and the following
f., ff.	and the following
fig., figs.	figure, figures
ibid	same reference
idem	same person
illus.	illustrated
infra.	below
loc. cit.	the place cited

mimeo.	mimeographed
ms.	manuscript
n.d.	no date given
n.n.	no name given
n.p.	no place given
no., nos.	number, numbers
op. cit.	previously cited
p., pp.	page, pages
par., pars.	paragraph, paragraphs
sic	thus
supra	above
vide	see

BIBLIOGRAPHY

The bibliography should give a clear, complete description of the sources that were used while preparing the report. Some bibliographies classify entries under headings such as Books, Periodicals, Newspapers, Reports, Public Documents, and Miscellaneous but most of them arrange items in a single alphabetized list. It is better to use the latter method and number the items consecutively.

Styte of citing. Items are usually listed alphabetically by author's surnames. but a chronological arrangement is used in some studies. When the author's name is not given, the work is listed under the name of the school system, institution, or agency that prepared the report. When no clue of authorship is available, the work is listed under the first important word of the title. To make the author's name stand out, the first line of each entry is typed flush with the margin and the remaining lines are indented, Double spacing or single spacing with double spaces between entries is used. The followihg samples present a simple and workable style :

1. For a book

Surname of author, give name or two initials. *Title taken from title page* (underlined). Edition if more than one, volume if more than one, place of publication ; publishers, date on title page or copyright date.

Selltiz, Claire et al. **Research Methods in Social Relations.** (Rev. in one vol.) New York : Holt. Rinehart and Winston, 1959.

2. For an article

Surname of author, given name or two initials, "Title of Article", *Name of Periodical* (underlined). Volume of perodical (month, day, year) beginning page.

Walsh J. Hartt. "Education in 2,000 A.D." **Nation's Schools** 57 (April 1956), 47—51.

3. For a newspaper

Name of Paper (underlined), month, day, year, section of paper. [If author and title are given, they precede name of paper].

Ordinarily newspaper items are not listed in the bibliography but they are cited in footnotes.

Editorial in **The Indianapolis News**, January 6, 1968.

4. For unpublished materials, [speeches, letters, mimeographed materials, etc.]

Surname of author, given name or initials, "Title of Material," nature of material and where it is available or was presented, date.

Davoe, Donald B. **Bibliography on Uses of High Speed Computers in Psychology**. Medford, Mass : Tufts University, Institute for Applied Experimental Psychology, (1957) (mimeographed), 2.

5. For a Thesis or Dissertation

Surname of author, given name or initials, "Title of Material", nature of material, where it is available or was presented, date.

Best, John W. **An Analysis of Certain Selected Factors Underlying the Choice of Teaching as a Profession**. Unpublished Doctoral Dissertation, University of Wisconsin, Madison, 1948.

Aids for citing. If you form the habit early in an investigation using the same style for like items on your bibliography cards, rechecking each item on every card for accuracy and completeness, and consulting a style manual when uncertain about how to write an entry, you will experience little difficulty in compiling a bibliography for your research report. The following general rules will help remove some of the common difficulties :

1. When two or more works by the same author are listed, an unbroken line about six spaces in length, followed by a comma, is sometimes substituted for his name after the first entry. The titles of his works are alphabetized under his name. Publications of which he is coauthor follow those of which he is sole author.

2. If a book has two or three authors, the second and third authors' names are written in the normal order. If there are more than three authors, the name of the first is given, followed by "et al." or "and others".

3. An editor or compiler is indicated by placing the proper abbreviation in the paretheses following the name.

4. When identifying the place of publication, the name of the city is sufficient if it is well known otherwise the name of the complete address is added.

Citing of Footnotes. The above mentioned bibliographical style is also used for footnotes, except that the regular paragraph indention rather than the underhung style is employed and the exact page of the quotation is given. But some institutions require further changes in footnotes, they stipulate that the author's given name must appear first, and some recommend a different form for the punctuation and placement of items.

Some of the illustrations for footnotes are as under :

Jacques Barzun and Henry F. Graff, **The Modern Researcher** (New York : Harcourt, Brace Jovanovich, 1977), p. 171.

Claire Selltiz et al., **Research Methods in Social Relations** (New York : Holt, Rinehart and Winston, 1959), p. 77.

Richard E. Banta, "New Harmony", **Encyclopaedia** Britannica (1968) 16 : 305.

J. Hartt Walsh, "Education in 2,000 A.D.", **Nation's Schools** 57 (April 1956), 47—51.

A comparison of Bibliography and Footnote Form

	Bibliography	Footnote
Indentation	overhanging—first line flush with margin, second line indented five spaces	regular paragraph indentation
Name order	last name first (of first author when more than one authors)	first name first
Placement	end of body of report—listed alphabetically by last name of first author	bottom of page with superscript
Punctuation	Author name **Title** Place of publication Publisher, date of publication.	Author, Title (Place of publication : Publisher date of publication)
Page reference	414 pp. (total number of pages in book or in article).	p. 23. (specific page location of reference)

Headings

When the manuscript is divided into chapters, each chapter begins a new page. The word CHAPTER is capitalised, followed by a capitalized Roman numeral, centered and placed four spaces lower than the usual top line of the text. The chapter title is centred and capitalized, a double space below the heading. Textual material follows three spaces below the title.

A major division of a chapter or of a short term paper is introduced with a **centered head** written in full capitals. Textual materials that follow are placed three spaces below the centered head.

A subdivision of the section of the part of the discussion under the **centered head** is introduced by a freestanding **side head**, flush with the left margin. For further subdivison of the discussion, a **paragraph side head** is used, with the usual paragraph indentation.

CENTRE HEAD (Full Capitals)

Side Head (major words capitalized)

Paragraph side head. (Only initial letler of first word capitalized).

Pagination

Page numbers are assigned to each page of the research paper or report. The title page or the initial page of a section (chapter, major subdivision, bibliography or appendix) does not have a page number typed on it, but a number is allowed for it in the series.

Page numbers are placed in the upper right hand corner, one inch below the top of the page and aligned with the right margin. Page numbers of the **preliminary section** of the manuscript use small or lower-case Roman numerals (i, ii, ii), beginning with the title page and ending with the last page preceding the main body of the paper. The page containing Chapter I is page I, but has no number typed on it. However, the next page is page 2. The bibliography and appendix are numbered serially and consecutively, following the last chapter.

Since correct pagination depends upon the final edited copy, assigning page numbers should be the final step before putting the manuscript into the binder or folder. Preliminary page numbers can be lightly penciled in and changed if additions, deletions, or corrections are made.

Preparation of the Report

When preparing a report you will adopt the patterns of working that are most suitable for you. But acquiring some knowledge of how others have solved common writing, revising, and typing problems may help you improve your system.

Drafting and Revising the Report. Some parts of a report, such as the review of the literature, may be written fairly early in an investigation, but most of the writing is done after the hypotheses have been tested. You collect data and organise them into tables, graphs or some other form that brings out relationships. You classify your notes and place them in the order that they appear in your outline. Then, while examining the data and notes, you write paragraphs of explanation and interpretation for each section of the report, compose transitional statements or paragraphs that lead the reader from one point to the next, and draft the conclusions.

Even at this stage of your work, you may reorder points in the outline to achieve a more logical presentation. Thus, in all but the final copy of a report, you should type each paragraph on a separate page so that sufficient room is left to make corrections or revisions. By so doing, you may rewrite materials, add paragraphs, or shift items from one section of the report to another without retyping entire pages.

Writing is arduous work. The prolonged process of composing, reordering, adding, deleting, and polishing is taxing. Successful writers redraft their reports many times before they are satisfied with the results, and their faculty advisers or editors may make many additional suggestions for improvement. Revising a report usually consumes many more hours than writing the original draft.

A beginner has much to learn before he or she can write effectively. You may make better progress if you from the following work habits :

1. Set aside regular hours for writing and observe your schedule faithfully.

2. Choose an environment that is conducive to work and make certain that the necessary reference books, dictionaries, and files are at hand.

3. To overcome the difficulty of getting started at each writing session, stop writing early each day and spend a few minutes organizing materials and listing the things to do the following day.

4. After working for a few days, set the draft aside and return later to read it critically.

5. Since items in a report do not have to be written in a consecutive order, compose a rough draft of a section whenever sufficient insight into the materials has been gained.

6. Concentrate on communicating information when writing. Do not let minor problems interrupt the flow of thought and block progress —skip over them and return later to find the proper word, devise a draft transition, check a fact or insert an illustration.

7. When bogged down in a particular paragraph or section of a report, reread the preceding materials and the outline to retain perspective.

8. Ask colleagues to read the report and point out any gaps, weaknesses, or ideas that are not clearly communicated.

9. Allot generous amounts of time for making unhurried, thorough revisions.

TYPING THE REPORT

Many students type their own research reports. Anyone with reasonable proficiency and a willingness to learn proper procedures can do an acceptable job.

Typographical standards for the thesis or dissertation are more exacting. Strikeovers, crossovers, insertions, and erasures are not permitted. Therefore, only typists with great proficiency should attempt to prepare thesis or dissertation copy. Although the expense of professional typing may seem high, the saving of time and excessive effort usually make this arrangement the wiser choice.

It is the writer's responsibility to present manuscript material to the professional typist in proper form. Except for minor typographical matters, the correction of major errors is not the responsibility of the typist. After the material is received from the typist, the student should proofread it carefully before it is turned in.

Before typing the final draft of a report, you read the manuscript critically, searching for inaccurate statements, omissions and inconsistencies. After making an exacting examination to locate errors in quotations, footnotes, tables, figures. paragraphing, sentence structure, headings, mathematics, spelling, style, proper names, or bibliography, you mark the copy to provide the typist with the necessary directions. The time spent in checking the above detail is well invested, for ultimately you alone—and not the typist—are held responsible for the contents of the report.

When typing any draft of an investigation, you should make carbon copies. The second copy is valuable if you lose the first one. Filing the duplicate and first copies in separate places gives added protection against loss through fire and other means.

Good quality of bond 8½ by 11 inches in size, of 13–to 16–pound weight, should be used for the origninal and first carbon copy of the thesis or dissertation. A lighter paper may be used for additional copies. For the term paper, any bond paper is acceptable. Only one side of the sheet is typewritten manuscript.

Pica type, with ten spaces to the inch, is preferred to elite, which has twelve. The type must be clean, and a medium-inked black ribbon should be used. Medium-weight, black carbon paper should be used for the copies. Carbon paper should be replaced often enough to insure clear and even copies. Special symbols not available on the typewriter key board should be carefully inserted, using black India ink.

To facilitate the proper placement of copy on the page a guide sheet may be constructed, showing the proper margins, the centre of the copy portion, and the number of lines from the top and bottom margins. This sheet should be ruled in black ink and placed beneath the first sheet, so that the markings show through.

The right margin should be one inch, the top margin 1½ inches, the bottom margin 1½ inches, and the left margin 1½ inches.

Textual material should be double-spaced. Long lists of materials may be single-spaced.

Paragraphs should be indented seven spaces for pica type, nine for elite.

Words should not be divided at the end of the line, unless completing them would definitely interfere with the margin. A few spaces runover is preferable. In dividing words, consult a dictionary for correct syllabication.

Direct quotations not over three typewritten lines in length are included in the text and are enclosed in quotation marks. Quotations of more than three lines are set off from the text in a single-spaced paragraph and indented four spaces from both left and right margins without quotation marks. Original paragraph indentations are retained.

The superscript is ordinarily placed at the end of the sentence of quoted material. Where several references are mentioned in one sentence, the superscript is placed after each name reference (Harry[1], Jones[2], and Smith[3], reported their findings).

For the benefit of a beginner in educational research, a design of synopsis to be submitted to a university for the purposes of obtaining approval for the project is given below :

SYNOPSIS

Synopsis of Dissertation to be submitted to Guru Nanak Dev University, Amritsar, in partial fulfilment of the requirements for the Degree of Master of Education.

Session 1983—84
Investigator— ....
Supervisor— ....

Statement of the Problem

A study into the consequences of Generation-gap among teachers

Introduction

Generation-gap is a phenomenon, the serious consequences of which are being felt at every step in our life and in every walk of life. We find the impact of this gap between the parents and the children, between the old and the young ; between the seniors and the juniors, between the instructors and the trainees ; between the teachers and the taught and between the experienced persons and the beginners. Any two categories of persons with about an age-gap of two decades between them quite often fail to have mutual understanding, workable equation, fellow-feeling and a reasonably smooth co-existence. Between them, they have clash of views, clash of attitudes, clash of values, divergent thinking and unnecessary aloofness. For many ailments of our society and failures of our ventures, the old blame the young and vice-versa. Almost every institution and establishment witnesses this situation of blame and counter-blame.

In our educational institutions also, the old teachers, who are on the verge of retirement, consider that the things would be much worse, when they are no more on the scene. They are proud of their own devotion to duty and dedication to the profession. They find that these essential traits are almost missing in the new generation of teachers. On the other hand, the young teachers have their own outlook towards life and the profession. They consider their knowledge to be comparatively more vast and up-to-date than that of the old lot among teachers. They are not very much convinced with the traditional and heckneyed style of teaching as adopted by the latter. They are in favour of establishing nearness with their students, which the old teachers do not approve of. They consider themselves as advanced and forward-looking and blame the old ones for their attachment with the outdated values and modes. These two categories of teachers quite often find themselves in disagreement and unable to discover a meeting ground. They find a wide generation-gap between them which does not permit them to come closer and work as a team. They differ in their attitudes towards the profession and the duties involved in it. They believe in different modes of teacher-pupil relationship and handling of the students. They have formed different habits of work and evolved varying approaches towards their day to day problems. The generation-gap between them, therefore, continues to persist.

But this gap needs to be bridged in order to create a more cordial and happy relationship between the two age-groups of teachers and to ensure a better cooperation towards the common goal. Their disagreement often leads to confrontation and wastage of human effort. It is in the light of this need that the investigator has chosen to study the consequences of this generation-gap among teachers, so that some strategy may be planned and adopted in order to bridge the gap and ensure better understanding between the two categories. The problem has been stated thus :

Statement of the Problem

"A study into the consequences of generation-gap among teachers"

Hypothesis. It is hypothesized that there are significant differences between the two categories of teachers in respect of their attitudes, modes of work, habits and dealings on account of the generation-gap.

The generation-gap among teachers causes significant differences between the two categories in respect of their attitudes, modes of work, habits and dealings.

Objectives of the stndy

The following are enlisted as objectives of the study :

1. To find the difference in attitudes due to generation-gap among teachers.
2. To find the difference in modes of work and habits due to this generation-gap.
3. To find the nature of human relationship among teachers in view of the generation-gap.
4. To suggest some methods and devices to bridge this generation-gap among teachers.

Sample

The study will be carried out on one hundred teachers teaching high classes of various schools in Jalandhar District. Fifty teachers will be taken from the age-group of 27-35 years, who will form the younger group and fifty will be taken from older age-group of 50-58 years, who will form older group. The groups will be balanced in respect of sex, qualifications, and environment.

Method and Procedure

A data collection tool will be prepared which will consist of a sufficient number of items determining the attitudes of teachers, a sufficient number of items giving their mode of dealing with students, and another set of items covering all the remaining aspects of relevant data. Most of the members of the sample will be contacted personally to obtain the answers to the items of the tool. Relevant statistical techniques will be employed in order to find out the differences and their significance.

Probable Chapters

The probable chapters of the research report will be as under :

1. Introduction
2. The Problem
3. Survey of Related Studies.
4. Methods and Procedure
5. Tabulation of Data
6. Statistical treatment, analysis and interpretation of data.
7. Conclusions and Generalisations
8. Limitations and Suggestions
9. Summary

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Appendices.

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